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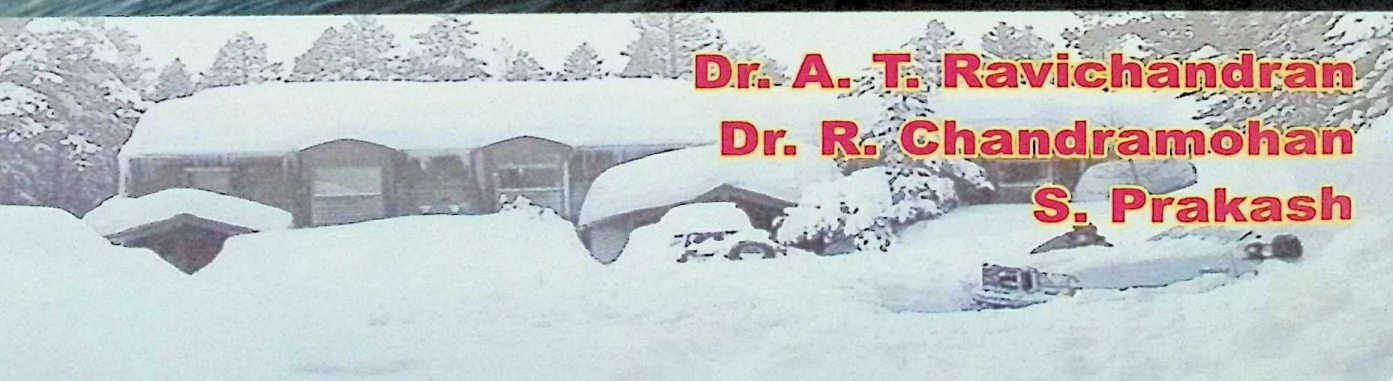
EARTHQUAKE PREDICTION



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EARTHQUAKE PREDICTION

by

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&

S. Prakash Pillai

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EARTHQUAKE PREDICTION

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CONTENTS

S. No.	Content	Page No.
	Preface	vii
	Acknowledgement	x
1	Prolude	1
2	Earthquake Management	2
3	Understanding Earthquake Zone	3
4	History of Earthquake	4
5	Climate Earthquakes	16
6	Our Proposals	17
7	Few Interesting Facts	21
8	Additional Findings and Perspectives	26
9	Ultimate Aim	134
10	Conclusions	135
11	References	135

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Preface

Inquire of the earth, the air, and the water of the secrets they hold for you. The development of inner senses will enable you to do this.

Discourse on Mabel Colins Light on the path.

During September 2018, I was touring Canada and stayed at Victoria BC, amazed at the beautiful spectacular scenic views. I was astonished at the amazing book reading habits of Canadians and street corner free libraries, Coffee shop libraries and many government and private run libraries. I was having a discussion with my principal collaborators and co-authors of our cluster involving 30 faculties and 50 researchers in one of the cluster meetings at National College, Tiruchirappalli and regarding a multidisciplinary approach to solve human problems by sharing our expertises. We were intended to develop some capabilities like setting a lowcost blood monitoring sensor system by thinfilm devices and Raman Studies to estimate few proteins or sugar directly in traces. We used to invite few guests from industries and Instrumentation Engineers tour meetings. Dr. A.T. Ravichandran has invited NDT engineer Mr. Prakash and National Instruments engineers. Post lunch sessions we had discussions with the engineers and they promised to extend support.

Before departing Mr. Prakash Pillai came to me with Dr. A.T. Ravichandran and conveyed his happiness over the proceedings and the unofficial conduct of several programmes promoting research. He said your effectively practicing research cluster is vibrant and want to be associated with it. He said he is also interested in sharing his ideas on predicting earthquake from the climate anomaly. Today the research cluster is transformed to Raman Research Foundation and Dr. A.T. Ravichandran is the Founder Research President. We met the next week at the same venue and asked Mr. Prakash to explain his problem and findings. Born in Tiruchirappalli, a non-destructive technical engineer running a training centre at Tiruchirappalli town of South Tamilnadu, producing thousands of NDT technicians who are in various laboratories around the globe, he slowly explained his efforts. His authority was well established in his presentation. Finally he said he wish to see the other end of this problem with a team. Immediately, we formed a team and tried to access few geologists in central and state governments and sought help. We also did literature survey and found that his observations do imply a possibility if put to a scientific scrutiny. He has earlier approached USGS and IIT's and few scientists assured help.

The uncertainties were recorded and made to a format.

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USGS and IIT scientists enquired us to quantify uncertainty.

They suggested that the uncertainty need to be reduced to a particular limit they expect and if achieved they will assist in taking it to next level of exploration. Instrumental support, Software's results and data analysis are needed and hence with limited data and to prove his method we started collaborating. The possible mechanics relating physics and the data available from standard set were updated daily were correlated. The middle and high level of correlation do exist.

One thing that stops climatologist from helping further is that all earthquakes happened after an anomaly. However, not all climate anomalies produce earthquakes. The team is still trying to solve this problem.

Though Prakash has independently published his findings in few journals our team aspired to publish a paper in Nature Geo, which got good review comments, and the questions that appeared in our discussions are being continued. Meanwhile our group want to retain the vast understandings of Prakash in the form of a book so that one day when mankind resolves the problem through this route his efforts get cited. Hence we wanted to write a book as a team.

One day Prakash said to our team like this, "I'm too tired Chandramohan, I trust you and my only wish is that our team existing or formed new should come out with a solid answer to this question. My lung cancer is permitting less energy and time but is gracious to give life to see my effort slowly grow to help Mankind. When the next earthquake will occur at a place with 100% accuracy and at least that is massive enough if it is unearthed and lives are saved I would be happy.

His idea is that climatologists estimate local climate of a place from more chaotic environment. When such a prediction is possible, why not the earthquake: which gives amazing signals before its occurrences. Similar to climate predictions, earthquake prediction is possible. Ravichandran told you are already at it. The moment climate data is released you predication result is there. Don't worry there should be a way out.

Next question he posed is that all science even today is primitive and a coordinated effort can take this subject to an advanced level. He looked at the internet and gave three predictions for Japan, Korea on the same day. We watched for the predicted earthquake. It happened. Exact location was the earlier expected known. But the time was little postponed to few days. We are convinced that it is a possibility to improve the estimation/prediction and we are working on it.

We understand that the earth's choice to provide shelter to innumerable lives in it signifies that it is an opportunity provider and not a destroyer. Earth locates itself at the right

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distance from the sun. Earthquakes are created as global phenomenon of providing energy to earth and not to make a disaster to lives. He is firm that "Global Warming" due to human activity is confused with climatology that deprives funding this type of projects which are need of the hour.

He said mainstream scientists are plagued by fake predictors and hence genuine predictors like Jim Berkland and his efforts to coordinate all prediction techniques to converge into improving advance predictions accuracy are becoming unnoticed. I felt very happy when I read about Jim Berkland and his efforts to unify his understanding with technology. Still he is treated as a predictor and not as a scientist.

I assured him that his works will be remembered as a enthuse to earthquake prediction and enable a co ordinate approach of all predictions through AI tools to solve this problem.

Prakash initially published his findings in a Normal Scientific Journal. I discussed in detail with him and Dr. Ravichandran and wrote a paper and tried to publish the article in Nature, Geoscience, Geophysics etc went in vain. I finally thought that I should record his work in any other form like a book. This book is dedicated to all the genuine earthquake predictors like him. The authors feel formation of network of predictors by different strategies to share their findings. They can predict in a common platform and the predictions be correlated to arrive at a strategy that may be partially funded through a project for its maintenance and coordination.

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Acknowledgements

It's our great pleasure to thank all scientists, earthquake predictors like Jim Berkland, Maverick Geologist, and my Co author and Research Collaborators who motivated to write this book on the Indian man Mr. Prakash Pillai who himself is our collaborator and who can predict earthquake and who has got appreciations even from Pakistan and few countries for excellent predictions. In fact, earthquake is happening everyday at somewhere and its predictions is considered unscientific today. However, attempts are taking place globally using different approaches. Though the startling predictions usually considered as some short of extrasensory nature and could not be accounted as scientific when we read few books on earthquake predictions we do understand that they can't be scudded as unscientific.

The availability of advanced packages and simulation techniques, GPS systems it should be possible to predict or estimate the occurrences of earthquake at least few days in advance that may facilitate evacuation at the right time saving precious lives. After reading Cal Orey's book on Jim Berkland I decided to write a book on Mr. Prakash Pillai and his predictions as its worth's in two ways.

His method of predictions by using climate anomaly seems to be scientific to me. Second, when I interacted with him, in spite of his detracting health conditions undergoing treatment for lung cancer he is very clear of his understandings and trying to reach the right team to save humankind. He was particular that his predictions should save human lives from timely alerts during natural calamities. He had strong beliefs that it is a possibility to relate his observations to science and advance it to find out the locations of earthquake and the time of occurrence accurately well in advance with few percentage of error that can be addressed by the recent advances. The book is not only an attempt to describe the individual predictor Prakash Pillai but it is an attempt to enthuse readers to understand nature and its challenges and put endeavour to save mankind from such challenges. "When there is a will there is always a way". Hope you enjoy reading this. Quotes are reported as such to make the subject interesting and to state that this search is true.

We thank all the previous contributors like Prakash in predicting earthquake in advance whose efforts will one day be fulfilled in the near future.

Dr. A.T. Ravichandran
Dr. R. Chandramohan
S. Prakash Pillai

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1. PROLUDE

1. One of the Authors is Predictor

Mr. Prakash Siva Pillai, a resident of Trichy, is an expert in Non-Destructive Testing with an International Level-III Certification. He holds a M.Sc. Degree in Physics and has studied numerous books on earthquakes and astronomy. His interest in earthquakes began in 1977 when a massive earthquake struck Mexico. Since then, he has been deeply engaged in studying earthquakes and their underlying processes.

Before our meeting, he had already predicted many earthquakes 15 days in advance, including the 2011 tsunami. He considers rainfall anomalies as excellent precursors to earthquakes. According to him, understanding why rainfall anomalies occur and identifying the contributing parameters could lead to a reliable earthquake prediction system.

Mr. Prakash theorizes that earthquake precursors supply the necessary thermal energy to the Earth. While most people attribute extreme weather conditions to complex and chaotic parameters such as the distance of the sun, solar flares, the moon's gravity, and the Jupiter effect, he argues differently. He points out that when the sea temperature reaches 26°C, evaporation is favoured. If the sun were the only source of ocean heating, then the ocean floor should remain much colder. He suggests that without additional heat supplied from beneath the Earth's surface, such high temperatures would not be possible.

Geological processes, including volcanic activity and natural geysers, contribute to this subsurface heating. Thus, while normal atmospheric conditions can be attributed to celestial effects like those of the sun, moon, and Jupiter, anomalies—he argues—are the result of internal Earth heating mechanisms. These anomalies may serve as precursors to earthquakes above magnitude 4, and analyzing weather data could help predict them.

He has created a chart to assist in his predictions, which includes careful marking of precursor areas and potentials. For instance, the devastating June 2011 Japan tsunami was followed by a 100-year record snowfall in the South Korean region. His earthquake

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predictions were shared via email with the USGS, Mike Blank Pipe, and Dr. Germi Gechar of the University of California.

Dr. Germi Gechar acknowledged his work as an excellent attempt. However, a dedicated team effort is required to elevate his method to an application level that could potentially save many lives through timely and accurate earthquake predictions. Mr. Prakash also shared his insights in a program aired on Jeya TV titled *Vanam Vasappadum*.

One of his key observations is that 100 mm of rainfall in certain areas could trigger an earthquake greater than magnitude 7. Moderate rainfall around the 50 mm level is termed the "Prakash Level." By closely observing climatic data, he has successfully predicted numerous earthquakes. Currently, his mechanism is under investigation by our team.

2. EARTHQUAKE MANAGEMENT

Many existing ideas for earthquake prediction remain at an amateur level. One such concept is the use of the **golden ratio** in earthquake management. Though not strictly scientific, the golden ratio is inherently present in many stable natural structures. Interestingly, even in solar neutrino mixing theories, the golden ratio is employed. This suggests that it could have potential implications in geophysical systems as well.

Efforts are underway to explore various data-driven approaches for earthquake prediction, including:

- **Relating solar flare data with earthquake occurrences.**
- **Using solar flares as potential precursors to earthquakes.**
- **Analyzing tidal data and gravitational effects on seismic activity.**

Gravitational theories and calculations indicate that the tidal forces exerted by the Moon are over **1,000 times stronger** than the combined gravitational effects of all other galactic bodies. This makes the **lunar tidal effect** a significant potential precursor to seismic events.

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3. UNDERSTANDING EARTHQUAKE ZONES

One of the most earthquake-prone regions in the world is the **Pacific Ring of Fire**, which includes:

- **New Zealand**
- The **eastern coast of Asia**
- **Alaska**
- The **western coast of North and South America**

This region has a long history of devastating earthquakes, often occurring at shallow depths of up to **33 km**, making it highly vulnerable. It is sometimes referred to as the **"shrinking zone"** of the Pacific Ocean due to its tectonic activity.

The Pacific Ring of Fire encompasses areas such as **China, Japan, Kamchatka (Russia), the Aleutian Islands (Alaska), California (USA), the Andes, Ecuador, Mexico, Chile, Peru**, and **New Zealand**. These **island-rich coastal zones** are particularly susceptible to medium to large-scale earthquakes. Due to its frequent and intense seismic activity, this area has been aptly named the **Ring of Fire.**

The Mid-Atlantic Seismic Belt

This seismic zone extends from the **North Pole**, near the Arctic Ocean floor, all the way to **South Africa**, passing through the **Rift Valley** and the **Equator**. It is known to be prone to **medium-depth earthquakes**. The seismic activity along this belt is associated with tectonic plate boundaries and spreading centers under the Atlantic Ocean, making it a region of continuous geological transformation.

The Alpine-Himalayan Trans-Atlantic Belt

This is an **elliptical seismic zone** that originates from **Gibraltar** and stretches eastward through the **Mediterranean Sea**, passing **Indonesia**. It encompasses several highly active geological regions, including:

- The **Alps mountain range**
- **European volcanoes**
- **North Africa**
- **Asia Minor**
- The **Caucasus region**

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- **Turkey, Iraq, Iran**
- The **Himalayas**
- **Myanmar**
- The **Philippines**

And a few **island regions** in Southeast Asia

This belt is vulnerable to **small, medium, and large-scale earthquakes**, making it one of the most seismically active zones on Earth.

4. HISTORY OF EARTHQUAKES

Globally, more than **50,000 earthquakes** are recorded **annually**, with **minor tremors occurring every few minutes** due to the vibrations of gentle seismic waves over the Earth's crust. However, the **movement of massive geological plates along fault lines** can trigger **devastating earthquakes**.

Although some earthquakes may cause **localized or restricted damage**, the **after-effects** can be far more catastrophic. These include:

- **Gigantic tsunamis** that flood towns and cause widespread destruction
- **Fires** that break out due to ruptured gas mains and collapsed buildings
- **Fissures** opening in the Earth
- The **violent movement of the ground** as powerful **surface waves** pass through

A surface wave with a height of just **a quarter of an inch** has the potential to **destroy ordinary buildings**. Earthquakes can also severely **damage infrastructure** such as roads, railways, bridges, and telecommunications towers. In **hilly regions**, they can trigger **landslides** and **floods**.

With the use of highly sensitive **seismographs**, it is now possible to **record and analyze** even the smallest movements of earthquake waves, aiding in understanding and, hopefully, future prediction.

List of Greatest Earthquakes

One of the most devastating events in recorded history is the **Great Lisbon Earthquake**, which occurred on **1st November 1755**. The quake originated **on the Atlantic Ocean floor**, west of Lisbon, Portugal. Its consequences were catastrophic:

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- A **35-foot-high tidal wave** swept across the coastal districts of Lisbon.
- Buildings were **completely destroyed**, killing around **60,000 people**.
- The impact was felt **within a 400-mile radius**, affecting **North Africa** and **Europe**.

Major Historical Earthquakes

Tokyo–Yokohama Earthquake – 1923

A major fracture in the Earth's crust off the coast of Japan triggered this devastating earthquake on **1st September 1923**. It violently shook **Tokyo and Yokohama**, causing the collapse of countless fragile structures in the densely populated twin cities. Over **a million houses collapsed**, and **fires broke out** in factories, gas mains, oil installations, and kitchens, resulting in the death of **approximately 250,000 people** and injuring many more.

San Francisco Earthquake – 1906

The **1906 earthquake** destroyed a significant portion of **San Francisco**, especially the city's central and most populated areas. It caused widespread fires and structural damage, leaving the city in ruins.

Kansu Earthquakes, China – 1920 and 1927

The **1920 earthquake in Kansu Province**, China, claimed **approximately 200,000 lives**. A second devastating event occurred in **1927**, where around **100,000 cave-dwelling people** were **buried alive** due to the collapse of mountain settlements and earthen structures.

Agadir Earthquake, Morocco – 1960

In **1960**, an earthquake struck **Agadir, Morocco**, killing **over 10,000 inhabitants** and causing **immeasurable damage** to the coastal city, which was almost entirely destroyed.

Iran (Kakhk) Earthquake – 1968

A powerful earthquake hit **eastern Iran** in **1968**, with its **epicentre at Kakhk**. The quake caused **severe destruction**, leaving numerous casualties and vast infrastructural damage in its wake.

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Distribution of Earthquakes across the Earth

Studies show that the **distribution of volcanoes** closely aligns with the global pattern of **earthquake occurrences.** The regions of **greatest seismic activity** are:

- The **Circum-Pacific Belt** (also known as the *Pacific Ring of Fire*), which includes coastal areas around the Pacific Ocean. Approximately **70% of the world's earthquakes** occur in this region.
- The **Mediterranean–Himalayan Belt**, encompassing **Asia Minor, the Himalayas,** and **northwestern China**, accounts for another **20%** of earthquakes.
- The **remaining 10%** of global earthquakes are distributed across other parts of the Earth's crust, which are generally considered more **geologically stable** and less prone to seismic activity.

However, it is important to note that **no region on Earth is entirely immune to earthquakes,** and **minor tremors** can occur anywhere.

5. Background

One significant development in earthquake risk mitigation is the **Earthquake Early Warning System,** which has been discussed by Elisa Buforn *and* Agustín Udías.

This volume compiles contributions from a specialized workshop held in **Madrid in February 2014,** focusing on **early warning strategies** for the **Ibero-Maghrebian region.** The content reflects **advancements in seismology, data analytics,** and the development of warning systems that can help **minimize casualties and damage** by providing advance alerts before a seismic event strikes.

The **Earthquake Early Warning System (EEWS)** is a relatively **recent development in seismology** that enables the issuance of **advance warnings**—with short lead times—to specific locations about the **impending arrival of strong ground motions** from an earthquake. These warnings are made possible once the **initial seismic waves (P-waves)** are detected by **adequate sensors** located nearer to the earthquake source.

One important application area for EEWS is the **Ibero-Maghrebian region,** which includes **Portugal, Spain, Morocco, Algeria, and Tunisia.** This region is

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historically prone to **large-magnitude earthquakes** that can be followed by **devastating tsunamis**, as in the case of the **Lisbon earthquake of 1755**.

This volume gathers contributions from a workshop held in **Madrid, February 2014**, focusing on the development and application of **early warning systems** to reduce seismic hazards and enhance preparedness in earthquake-prone regions.

Instrumentation in Earthquake Seismology

Another key aspect of modern earthquake science is the role of **instrumentation**, addressed comprehensively by Jens Havskov *and* Gerardo Alguacil.

This work provides an **up-to-date overview** of modern instruments used in earthquake seismology, covering both **theoretical foundations** and **practical applications**. The main topics include:

- **Selecting and installing equipment** for seismic stations
- **Designing and setting up seismic networks** and arrays
- **Maintaining and calibrating** seismic instruments

It also offers detailed descriptions of components such as:

- **Seismic sensors**
- **Digitizers**
- **Seismic recorders**
- **Communication systems**
- **Software** used for station and network operation

In its **second edition**, the book includes expanded content on:

- **MEMS accelerometers**
- **Sigma-delta analog-to-digital converters (ADCs)**
- **Dynamic range** analysis
- **Virtual seismic networks**

This book is primarily intended for **seismologists, engineers, and technicians** working with seismic instrumentation. However, it also serves as a valuable resource for **students and educators**, offering a combination of **practical "know-how"** and sufficient **theoretical explanation** to understand the core principles of seismic data acquisition and monitoring.

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This work is based on the authors' **combined experience of over 35 years** in the fields of **seismology and geophysics**—one a seismologist and the other a physicist. Their objective is to provide both **practical guidance** and **theoretical background** necessary to understand the **fundamentals of seismic instruments**, while also offering a detailed comparison of the various **instrument types** and **manufacturers** currently available in the market.

Key Features:

- **It covers a wide range of modern seismic instruments**, including sensors, digitizers, recorders, communication systems, and supporting software.
- Provides **practical advice** on:
  - Selecting and installing seismic equipment
  - Designing and configuring seismic networks and arrays
  - Calibrating and maintaining instruments for optimal performance
- **Compares equipment** from multiple manufacturers, helping professionals make **informed decisions** based on capabilities and requirements.
- Includes a detailed section on **SEISAN software**, a widely used and freely available seismic analysis tool developed by the **University of Bergen**.
- Offers **comprehensive tables and illustrations** to enhance understanding of both hardware and software systems.
- The **second edition** of the book includes new developments in:
  - **MEMS accelerometers**
  - **Sigma-delta analog-to-digital converters**
  - **Dynamic range analysis**
  - **Virtual seismic networks**

useful for a **broad range of professionals**, including:

- **Seismologists**
- **Engineers**
- **Technicians**
- **Graduate and postgraduate students** working with seismic data and instrumentation

By blending essential theory with real-world applications, the book serves as both a reference manual and an educational resource, aiming to solve practical problems

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encountered in the field of seismology. Whether **installing seismic stations, setting up networks and arrays, calibrating stationary or portable instruments, working with response data,** or **teaching about seismic instruments,** professionals and academics now have access to a **practical and authoritative sourcebook** in the form of the book *Instrumentation in Earthquake Seismology.*

This book also includes the **SEISAN** and **SEISLOG** software systems, which are available for download from:

- Springer Extra Materials
- University of Bergen Seismology Software

Primarily intended for **seismologists and technicians,** the book aims to serve as a **practical guide,** with only the necessary amount of theory required to understand the **basic principles.** Most common and practical problems encountered in the field are addressed in this manual.

GPS and GNSS Technology in Geosciences provides an **interdisciplinary approach** to the application of modern **Global Positioning System (GPS)** and **Global Navigation Satellite System (GNSS)** technologies in geoscientific research and practical applications.

As GPS/GNSS signals provide critical data about **Earth's surface characteristics** and **land composition,** their usage has grown rapidly in both **scientific** and **commercial** contexts. This book highlights:

- The **principles and operational mechanisms** behind GPS/GNSS systems
- The growing **demand** for GNSS in Earth observation
- **Case studies** that demonstrate the practical value of these technologies in **environmental monitoring, hazard assessment,** and **scientific research**

It is an essential resource for **researchers, engineers,** and **students** in **geosciences, remote sensing,** and **geospatial technology.**

This volume is the **first in a two-part series** focusing on **earthquakes and multi-hazards** surrounding the **Pacific Rim.** The **Circum-Pacific Seismic Belt,** also known as the **Ring of Fire,** accounts for roughly **80% of the world's largest**

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earthquakes, making it an essential area for studying **earthquakes**, **tsunamis**, **landslides**, and other related hazards.

This book features **16 peer-reviewed papers**, divided into three key sections:

1. **Earthquake Physics**
   - Rheological properties derived from laboratory experiments
   - Regional seismic studies in the **Gulf of California** and **China**
2. **Earthquake Simulation and Data Assimilation**
   - Enhancements in earthquake simulators
   - Statistical methods for model evaluation
   - Automated fault-slip detection using **interferometric data**
   - Variability in **earthquake stress drops** in California
   - Incorporation of **social media data** to supplement physical sensors in estimating local earthquake intensity
3. **Multi-Hazard Assessment and Forecasting**
   - Models for forecasting and evaluating risks of combined natural hazards

This serves as an excellent **scientific reference** for **researchers**, **disaster risk analysts**, **earthquake engineers**, and **policy-makers** involved in hazard assessment and mitigation strategies in seismic zones. **Probabilistic tsunami hazard assessment**, several studies on **time-dependent seismic hazard analysis** around the Pacific Rim, and a detailed study on **induced and triggered seismicity** at the **Geysers Geothermal Field in California**.

Rapid advances are being made in our **understanding of multi-hazards**, as well as in the **development of tools** to study and mitigate them. This volume offers a **representative cross-section** of how **state-of-the-art tools and knowledge** are currently applied in assessing multi-hazards around the Pacific Rim. It serves as an invaluable resource for **scientists**, particularly those involved in **seismic and tsunami hazard research**, and also for **students in geosciences**, providing insights across a **broad spectrum of hazard-related topics**.

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Temperature Change as an Earthquake Precursor

There appears to be a relationship between **temperature anomalies** and impending earthquakes. A **significant temperature rise** of **10°C to 15°C** was recorded before earthquakes in:

- **Lunglin, China (1976)**
- **Przhevalsk, Russia (1970)**

These readings were taken from **hot springs and wells**, located **10 km and 30 km** away from the s, respectively. The **precursory periods** observed were **42 and 72 days**, indicating a potential thermal anomaly before seismic activity.

Water Level Changes

Significant **fluctuations in well water levels** have been reported prior to major earthquakes:

- A **drop in water level** was observed a few days before the **Nankai earthquake, Japan (1946).**
- A **rise of 3 to 15 cm** was recorded before the **Lunglin** and **Przhevalsk** earthquakes.
- In **Meckering, Australia (1968)**, water level rose by **3 cm just hours** before the quake.
- In China, a rise in well water levels was recorded before the earthquakes in:
  - **Haicheng (1975)**
  - **Tangshan (1976)**
  - **Liuquiao and Shanyin (1979)**

Experiments conducted in the **Kurile Islands** used deep wells (410–670 meters) at distances up to **700 km from epicentres** to monitor water levels as a predictive measure for earthquakes of magnitude **4 and above.**
Findings suggest:

- **Water level drops 3–10 days** prior to an earthquake
- **A rebound or sharp rise** occurs as the earthquake strikes

This technique effectively tracks **crustal deformation** and is an important **precursor monitoring method.**

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Radon Gas Anomalies

Radon, a radioactive gas, is often released from **rock fractures** before an earthquake. It dissolves in groundwater, leading to **increased radon concentration** in wells. Notable instances include:

- **Tashkent (1972):** A 15% to 200% rise in radon concentration was observed **3 to 13 days** prior to a seismic event.
- In **China**, significant increases were noted:
  - **50% (18 days before)** the **Tangshan earthquake (1976)** at Langfang
  - **70% (6 days before)** the **Luhuo earthquake (1973)** at Guzan
  - Distances from epicentres were **130 km and 200 km**, respectively

In **India**, a correlation between radon anomalies and the **Uttarkashi earthquake (1991)** was observed at **four sites in Kangra** and **one in Amritsar**.

Theory of Seismic Gaps

The **seismic gap theory** identifies regions along tectonic plate boundaries that show **less seismic activity** compared to adjacent areas. These gaps are believed to be **locked segments** where stress builds up until released in a major earthquake.

- Soviet seismologist **S.A. Fedotov** studied **12 major earthquakes** in northern Japan (1904–1963). He observed:
  - Each earthquake occurred in a distinct segment
  - The segments **did not overlap** but were **adjacent**
  - Earthquakes occurred in areas that had remained **quiet for 39 years or more**

Based on this, Fedotov predicted future earthquakes in **Kurile Island**, which subsequently occurred.

Building on this, **Dr. Kiyo Mogi of Tokyo** successfully predicted several earthquakes in Japan using this theory.

In a separate application:

- **Masakazu Ohtake, Tosimatsu Matsumoto,** and **Gary V. Latham** from the **University of Texas Marine Science Institute** predicted a **major earthquake in southern Mexico** near **Puerto Angel** using the same seismic gap approach.

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Changes in Seismic Wave Velocity

Understanding changes in the **velocity of seismic waves** has provided further insights into earthquake prediction:

- **P-waves (Primary)** and **S-waves (Secondary)** originate from the earthquake focus.
- **P-waves travel faster** and are recorded first by seismographs.
- The **time difference between P and S wave arrivals** is called the **lead time.**

Russian seismologists discovered that:

- **Lead time decreased** significantly in the **days to months** before an earthquake.
- Just before the quake, the lead time **returned to normal.**
- The **longer the duration of the abnormal lead time,** the **stronger** the expected earthquake.

This concept was experimentally validated in **1973** by **Trio Lynn Sykes, Christopher Scholz,** and **Y.P. Aggarwal,** who measured **P and S wave velocities** on rock samples and confirmed this behavior.

Overview of Existing Prediction Techniques

Various approaches have been proposed and tested to predict earthquakes. Some combine scientific instrumentation with observational insights, while others lean toward unconventional but observationally grounded methods.

Jack Coles' Method (Syzygyjob.com)

Jack Coles uses electronic interference on devices such as TVs and radios as a means of earthquake prediction. By detecting static or unusual tones — what he refers to as "eartones" — he interprets these signals as precursors. His method involves:

- Monitoring interference noises on TVs, phones, and radios.
- Utilizing a **$50,000 frequency analyzer** to extract meaningful data.
- Achieving a **57% predictor accuracy rate,** according to his reports.

However, seismologists such as **Prof. Roger Bilham** from Boulder, Colorado, argue that earthquake prediction is currently **scientifically impossible.**

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Jim Berkland's Animal Behavior Theory

Jim Berkland, a geologist known for his unconventional approaches, suggested that:

- Animals, particularly **dogs**, exhibit unusual behavior before earthquakes.
- He speculated that animals contain **magnetite**, which allows them to detect minute changes in the **Earth's magnetic field**.
- Anecdotal evidence includes **increased reports of lost pets** before quakes, which he used as a predictive measure.
- Berkland once predicted an earthquake with a **week's accuracy** using pet disappearance data.

He emphasized that prediction shouldn't be left only to experts, stating:

"It is too important to leave it to experts."

China's Haicheng Earthquake (1975)

One of the most cited successful earthquake predictions occurred in **Haicheng, China**, where:

- Unusual **animal behavior** was observed.
- Authorities evacuated the city **hours before a 7.3 magnitude quake** struck.
- **90% of the city's buildings** were damaged, but **99,000 lives were saved**.

This event led to increased global interest in earthquake precursors, particularly in **animal behavior and atmospheric anomalies**.

Atmospheric, Magnetic & Tidal Precursors

In the **Alaska earthquake of 1964 (magnitude 9.2)**, magnetic anomalies were detected in the **ionosphere** using equipment near **Kodiak Island**. Anomalies included:

- **Low tides**
- Rats and mice appearing in the streets
- Strange sea animal behavior

Such anomalies support the theory that earthquakes may be **preceded by electromagnetic disturbances**.

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Solar Influences

Solar activity is another area being explored:

- **Solar flares (CMEs)** and **sunspot activity** affect Earth's **magnetosphere.**
- These interactions may **trigger seismic events** by influencing stress within tectonic plates.

Related terms in the field include:

- **Seismic windows**
- **Barro's Equation**
- **Tidal surges**
- **Magnetic field shifts**
- **Ocean and jet stream changes**
- **Extreme weather patterns**

Thermo-Chemical & Geophysical Indicators

A significant thermal anomaly was observed in the **Turkey region**, where:

- **Day and night temperature differences** increased **4 days prior to an earthquake.**
- On the day of the quake, thermal readings **returned to normal.**
- This is believed to be due to **local greenhouse gas escape**, involving:
  - **C–O, C–N, and C–C bond vibrations**
  - **C–H and N–H reclaim vibrations**

Such findings suggest a **coupling mechanism between lithosphere and atmosphere**, indicating possible forecasting tools.

4. Theory of Seismic Gaps

The **Seismic Gap Theory**, introduced by **S.A. Fedotov**, suggests:

- Regions of **seismic inactivity** along plate boundaries are **more likely to experience future quakes.**
- This theory helped predict earthquakes in **Kurile Islands.**
- Later expanded by **Dr. Kiyo Mogi** in Japan and three geophysicists (Ohtake, Matsumoto, Latham) in Mexico.

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5. CLIMATE-EARTHQUAKE CONNECTION: OUR RESEARCH

Our team, led by **Dr. A.T. Ravichandran** and supported by **Prakash**, explored:

- The role of **thermal anomalies**
- The release of **magnetic ions** near the epicentre
- **Weather data as a predictive tool** for seismic activity

A paper titled **"Early Earthquake Prediction – A New Strategy Proposed to Explore Weather Data"** was submitted to *Geophysical Research Letters (GRL)*. However, it was declined with the following editorial note:

"The paper has conclusions that are not substantiated by data or analysis. It may be better suited for a more specialized journal."

Despite the rejection, the editor acknowledged the **potential** of the work and encouraged **further development.**

Regional Observations and Seismic Zones

India and the Himalayas

India's **Himalayan region**, one of the youngest and most active mountain belts, continues to experience **tectonic convergence** at ~2 cm/year.

- **Major earthquakes in history**:
  - Nepal: 1803, 1833, 1934
  - Shillong: 1897
  - Kangra: 1905
  - Assam: 1950
  - Kashmir: 2005
- **Recent ones**: Sikkim (2011), Nepal (2015), Manipur (2016)

Scientists predict future events of **magnitude ≥8.0**, especially in **Zone IV and Zone V.**

Paleoseismology

Trenching and carbon-dating techniques reveal **ancient earthquake patterns**:

- Notable quakes inferred in **1125, 1400, 1505, and 1555**

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Japan 2011 Earthquake & Atmospheric Coupling

On **March 11, 2011**, a **magnitude 8.9 earthquake** struck off the coast of **Sendai, Japan**, resulting in one of the **largest quakes in modern history**.

- Anomalies observed:
  - **Infrared radiation increases** in the atmosphere
  - Support for **Lithosphere–Atmosphere–Ionosphere Coupling** theory
  - **Radon emissions** and **ion release** led to thermal radiation detected via satellites

These findings validate **Prakash's claim** that **atmospheric and subsurface processes are interlinked**.

6. OUR PROPOSALS

We submitted a revised manuscript titled **"Predicting Earthquake by Modeling from Climate Anomaly by Prakash Method"** to *Nature*. It is grounded in the hypothesis:

"The opposite of a deep truth is also a deep truth" – *Professor Abdus Salam*

The submission was influenced by **McGuire (2010)**, who highlighted the impact of **climate extremes on geophysical responses** such as:

- Volcanic and seismic activity
- Landslides and tsunamis
- Debris flows and glacial floods
- Submarine gas-hydrate destabilization

These phenomena, triggered by **climate anomalies**, validate our belief in the **climate-earthquake nexus**.

Climate Anomalies and Earthquake Prediction: A Geo-Atmospheric Perspective

1. Climate Change and Geological Responses

The rising momentum of global warming awareness has led to increasing concern about the geosphere's response to average temperature increases. Human activities such as **excessive mining, reallocation of water, deforestation, intensive dynamite use**, and **underground nuclear testing** may have induced geospheric

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perturbations, potentially contributing to **abrupt environmental shifts** since the **Last Glacial Maximum (LGM)** around 20,000 years BP.

Notably, the **reorganization of climatic zones** and a **cumulative sea level rise of approximately 130 meters** have been documented. These observations suggest that **climate change may act as a driver of geological processes**—a hypothesis that, while compelling, challenges the traditionally slow geological time scales and demands in-depth scrutiny.

Although **human activities are largely crustal**, and may not impact deep Earth dynamics like mantle or core interactions directly, **large-scale oceanic water redistribution** could impose stress changes on the lithosphere, as discussed in several studies (Matthews, 1969; Podolskiy, 2008). Such mass redistributions can trigger structural reconfigurations deep within the Earth.

2. Ice-Mass Loss and Geomorphic Hazards

Liggins et al. (2010) linked **ice-mass loss, rapid sea-level rise**, and **increased precipitation** to shifts in geomorphological behavior. These changes, through **load-pressure variations** and **pore-water pressure increase**, may lead to:

- Fault ruptures (Hampel et al. 2007, 2010)
- Volcanic eruptions and magma mobilization (McNutt & Beavan, 1987; Pagli & Sigmundsson, 2008)
- Submarine landslides (Lee, 2009; Tappin, 2010)
- Subaerial landslides (Pratt et al., 2002)

3. Modelling Climate and Geohazards

Felicity Liggins et al. (2010) emphasized that the **past, present, and future influences** on climate can be simulated using:

- **Simple Climate Models (SCMs):** Focused on global energy balance and carbon cycles.
- **General Circulation Models (GCMs):** Simulate large-scale atmospheric and oceanic processes with mechanistic depth.
- **Regional Climate Models (RCMs):** Nested within GCMs to account for orographic and land-use factors at higher resolutions.

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These models are affected by two main uncertainties:

- **Natural variability:** Seasonal to decadal fluctuations.
- **Model limitations:** Inherent approximations and parameterizations.

Multiple models are used to accommodate these uncertainties, recognizing that under identical driving conditions, different models may yield diverse projections.

Liggins et al. advocate combining **climate model projections** with an understanding of **geohazards** to enhance prediction of climate-driven seismic risks.

4. Sea-Level Rise, Temperature, and Precipitation

IPCC projections indicate:

- **0.18–0.59 m rise in sea level by 2100** (without rapid ice dynamics).
- Up to **2 meters** rise possible under extreme scenarios.
- **Thermal expansion, Greenland and Antarctic ice loss,** and **GHG stabilization delays** could extend sea-level rise commitment for centuries.

Precipitation remains highly uncertain:

- **High-latitude increases** are generally agreed upon.
- Many regions exhibit **discrepancies** in direction and magnitude.
- However, **intensity of precipitation events** is projected to rise globally.

Regions such as the **Arctic** and **Himalayas** may experience **8–15°C local warming** in high-emission scenarios, significantly beyond the global average. These changes have **profound implications** for tectonic stability and geosphere stress distribution.

5. Proposed Hypothesis: Climate-Induced Geothermal Contribution to Earthquakes

We propose that **climate anomalies across land, glacier, and ocean** contribute to **geothermal energy redistribution**, potentially serving as **precursors to earthquakes**. Zones of seismic influence are already well mapped; what remains is leveraging **climate anomaly datasets** for forecasting future seismic activity.

This hypothesis encourages **integrated collaboration** across disciplines:

- **Climate scientists**

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- **Geophysicists**
- **Earthquake modellers**

The proposed project includes:

- Recruitment of a **full-time retired scientist as coordinator**
- **Three research associates**
- **Computational infrastructure**
- **Institutional collaboration** with IMSc and IIT Madras for national/international events.

6. Global Scenario: Earthquake Monitoring and Prediction

Daily earthquakes are recorded globally. Websites such as https://www.earthquaketrack.com/ provide real-time data including:

- Magnitude
- Depth
- Location

While **real-time recording** is reliable, **advance earthquake prediction** is still elusive. Nonetheless, the **availability of massive datasets** offers new opportunities for **retrospective model testing** and **hypothesis validation**.

Despite skepticism, global efforts to link climate anomalies to seismic events are gaining traction.

7. Prediction a possibility

Though the scientific community maintains that **accurate short-term earthquake prediction is not yet achievable**, studies increasingly suggest that **climate anomalies can influence geodynamic responses**. By integrating high-resolution climate modeling with geological data, it may be possible to **forecast regions of increased seismic risk**.

This interdisciplinary approach represents a **promising direction** in earthquake science and **merits serious international collaboration and funding.**

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7. FEW INTERESTING FACTS

Earth's "hum"on ocean floor

Image credit: NASA/Goddard

An image of the Earth constructed from NASA's Terra satellite.

Scientists have long known that earthquakes can cause the Earth to vibrate for extended periods of time. However, in 1998, a research team discovered that the Earth also constantly generates a low-frequency vibration signal even in the absence of earthquakes. Since then, seismologists have proposed various theories to explain the existence of this continuous vibration — from atmospheric disturbances to ocean waves moving over the seafloor. They have also measured the vibration using seismometers on land, but until recently, they had not successfully measured it at the seafloor. Such measurements could help scientists better quantify the sources of these vibrations. Now, using seismic instruments placed on the ocean floor, researchers have successfully quantified the Earth's vibrational "hum." A new study published in *Geophysical Research Letters*, a journal of the American Geophysical Union, determined the frequencies at which the Earth naturally vibrates at the ocean bottom and confirmed the viability of using ocean-based instruments to study this hum.

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Capturing the hum at the ocean bottom could provide new insights into the source magnitude, according to Martha Deen, a geophysicist at the Paris Institute of Earth Physics in Paris, France, and lead author of the new study.Additionally, the findings could be used to map the Earth's interior in greater detail and with improved accuracy. Including hum data from seismometers on the ocean floor offers a better overall picture than using land seismometers alone, by increasing data coverage in previously unmonitored areas."Earth is constantly in motion, and we wanted to observe these movements because the field could benefit from having more data," Martha Deen said.

Capturing the Hum

The new research examined Earth's permanent free oscillations — low-frequency seismic signals that can only be measured with highly sensitive instruments. The vibrations caused by these signals are constantly present in the ground and are observable even in the absence of earthquakes.

A previous study, published in *Geophysical Research Letters*, demonstrated that the movement of ocean waves over continental shelves is responsible for generating a large portion of the signal, and it provided the first quantitative modeling of the hum over the course of one year. Other research has suggested that atmospheric turbulence may also contribute to the signal, but this mechanism can explain only part of the vibration.

Most existing research on the hum signal has successfully examined it using seismometers located on land, not on the ocean floor. Gathering accurate data from seismometers beneath the ocean surface was long considered impractical because ocean waves and seafloor currents generate high levels of ambient noise.

However, 70 percent of the Earth's surface is covered by water, so being able to measure the human these a floor would enable Scientists to analyze the phenomenon using data over the entire globe, Deen said. Some efforts to assess the human submarine related activity are also reported.

https://pubs.geoscienceworld.org/gsa/geology/article/46/6/511/530334/Giant-submarine-landslide-triggered-by-Paleocene

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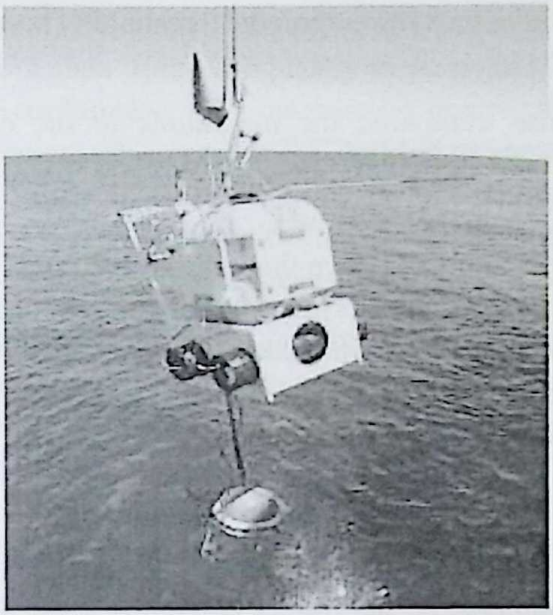

Image credit: *RHUM-RUM experiment / Meteor Cruise*

An Ocean-Bottom Seismometer used in the study being deployed into the water.

In the new study, the researchers first gathered seismic data from 57 seismometer stations located on the ocean floor in the Indian Ocean, east of Madagascar. These stations were deployed from 2012 to 2013 as part of an earlier study published in *Eos*, which was designed to image volcanic intraplate hotspots.

The authors selected seismic data from the two stations with the highest data quality and ensured that any signals generated by earthquakes were properly corrected. They then applied a combination of techniques to remove interference caused by oceanic noise. Infragravity waves, currents, and electronic glitches were accounted for, and the researchers were able to reduce the noise level to approximately the same as that of a quiet land station.

Because Deen and her colleagues successfully accounted for these sources of interference, they were able to capture the Earth's hum using seismometers at the bottom of the ocean.

The study determined that Earth's natural vibrations peak at several frequencies between 2.9 and 4.5 millihertz. These vibrations can't be heard by humans because they

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are approximately 10,000 times lower than the threshold of human hearing, which starts at 20 hertz.

The authors also compared the magnitude of the observed hum signal to measurements from a land station in Algeria and found that both signals had a similar amplitude.

Deen and her co-authors believe that other researchers can apply their findings to better model the structure of Earth's interior. Scientists traditionally study the interior using seismic waves generated by earthquakes, but this only works at specific times and locations where earthquakes occur. Using the hum signal as a source of seismic waves could overcome this limitation, as the hum is generated continuously in many ocean–continent areas across the planet's surface.

Combining data from both land and ocean-bottom seismometers gives seismologists a more complete picture of the hum signal compared to using land stations alone, according to Deen. The increased density of data points would improve imaging resolution and could help scientists map the Earth's interior down to 500 kilometers (310 miles), she said.

The atmosphere above the epicentre of the earthquake in Japan underwent unusual changes in the days leading up to the disaster, according to preliminary data. This was observed by Dimitar Ouzounov, a professor of Earth sciences at Chapman University in California. The theory, which in scientific circles is called **"Lithosphere–Atmosphere–Ionosphere Coupling Mechanism,"** suggests that The Atmosphere–Ionosphere Coupling Mechanism goes like this: Right before an earthquake, the stressed fault releases more gases—especially the colorless, odorless radon gas. Once in the upper atmosphere (ionosphere), the radon gas strips air molecules of their electrons, splitting them into negatively charged particles (free electrons) and positively charged particles. These charged particles, called ions, attract condensed water in a process that releases heat. Scientists are trying to detect this heat in the form of infrared radiation to help predict earthquakes. However, they acknowledge that reliable earthquake prediction is still a long way off.

Researchers studied atmospheric changes in the days leading up to the 2011 Japanese earthquake. They found that the concentration of electrons in the ionosphere increased, as did the levels of infrared radiation. March 8—three days before the

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quake—was the most anomalous day. According to Dimitar Ouzounov, the team has analyzed data from more than 100 earthquakes in Asia and Taiwan and has found similar correlations for earthquakes with magnitudes greater than 5.5 and depths less than 50 kilometers (31 miles). The team is now working to involve researchers in Japan and worldwide. Terry Tullis, an emeritus professor of geological sciences at Brown University, has proposed organizing a workshop for Earth and atmospheric scientists to further investigate the ionospheric changes associated with earthquakes.

On 6 April 2009, an earthquake devastated the Italian city of L'Aquila. Dr. Rachel Grant of the Open University observed that 96% of a large and actively breeding colony of toads had suddenly disappeared. Five days later, the earthquake struck. The toads did not reappear until five days after the quake. According to Grant: "Our findings suggest that toads are able to detect pre-seismic cues, such as the release of gases and charged particles, and use these as an early warning system."

Roger Bilham of the University of Colorado in Boulder and Rebecca Bendick of the University of Montana in Missoula have shed light on the possible link between Earth's rotation and seismic activity. In an interview with *The Observer*, Bilham said, **"The correlation between Earth's rotation and earthquake activity is strong and suggests there is going to be an increase in the number of intense earthquakes next year".**

The year **2018** was projected to witness a surge in seismic activity, as scientists warned that variations in Earth's rotational speed could lead to an increase in high-magnitude earthquakes globally. These devastating quakes were expected to result in loss of life and property, especially in densely populated tropical regions.

However, experts from **New Zealand** countered the views of the two American scientists. One of them even likened the idea to the predictions of the controversial "Moon Man" Ken Ring, according to a report by the *New Zealand Herald.*

Dr. **Virginia Toy**, a professor of geology at the University of Otago, said it is not unusual for correlations to be made between natural events and other phenomena. "Some of these yield statistically defendable correlations; others don't," she said.

Meanwhile, two scientists from **Japan's Tohoku University** and two from the **University of California** discovered a previously unrecognized pattern that occurs just

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before large earthquakes. Their study revealed that **"slow-slip events"**—silent and subtle deformations—often precede major quakes. These events occur periodically in Japan's megathrust zones and have been found to correlate with large earthquakes. During the magnitude 9.0 earthquake that struck north eastern Japan in 2011 and triggered a deadly tsunami, data showed that these subtle slips began to accelerate days before the quake.

Uchida and her colleagues analyzed seismic data dating back to 1984 for two of Japan's largest islands, according to *Phys.org*. They identified 1,500 examples showing repetitive patterns, which helped them estimate the speed of tectonic plate movement. By comparing slippages with measurable quakes of magnitude 5 or higher, they found evidence of a speed-up in slow-slip activity just before major earthquakes. GPS data used to track tectonic movement matched the calculated rates. "The results suggest the possibility of an earthquake is greater when slow slips are occurring," Uchida said. "By taking such relationships into account, earthquake probability forecasting can be improved."

8. ADDITIONAL FINDINGS AND PERSPECTIVES:

- **Austria**: Continuous measurements of radon in springs have been used to distinguish between earthquake-sensitive and insensitive springs. Radon anomaly data worldwide show potential correlations between certain radon patterns and epicentral distances, according to **Harry Friedmann** of the University of Vienna.
- In **2012–2013**, Austria measured parameters like radon activity in soil gas, permeability, dose rate, and gamma radiation at 100 sites to improve earthquake prediction. Correlations between these parameters are under study.
- The **seismic record of Nigeria** shows the occurrence of small to medium magnitude quakes, contrary to the belief that the region is aseismic.
- **Tierney** advised residents in vulnerable areas to remain alert and maintain earthquake preparedness, especially if it has been a long time since the last quake.
- The **US Geological Survey (USGS)** and its California partners are exploring the benefits of an earthquake early warning system.

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- Seismologist **Mike Blanpied** (USGS) told *EarthSky* that there is reason for optimism in earthquake prediction, thanks to expanding data, new theories, and more powerful computational tools.
- Despite these advances, **scientific prediction of earthquakes remains elusive,** though hope for future breakthroughs remains.
- **Magnitude 10 or larger earthquakes cannot happen.** Earthquake magnitude is limited by fault length. The longest known faults aren't long enough to produce a magnitude 10 quake. The largest quake ever recorded was a **magnitude 9.5** in **Chile on May 22, 1960,** along a ~1,000-mile fault.

Common Myths and Clarifications:

- **"Earthquake weather"** is a myth. Ancient theories, including Aristotle's belief that trapped winds caused earthquakes, led to speculation about weather links. However, modern statistics show earthquakes occur equally across various weather conditions.
- Major **storm systems** can influence **slow-slip events** or minor tremors, but their overall impact on damaging quakes is **statistically insignificant,** according to **Dr. Malcolm Johnston.**
- **Solar flares and magnetic storms** are part of "space weather" and may affect technology, but there is **no demonstrated causal link to earthquakes.** Earthquakes are driven by internal Earth processes, not solar activity.

Animal Behavior:

- The earliest known record of **unusual animal behavior before a quake** comes from **Greece in 373 BC,** when rats, snakes, and insects reportedly fled before a major earthquake. Though such behavior has been widely observed anecdotally, **consistent and scientifically proven animal responses remain elusive.**
- In one case, an earthquake forecast in **China** was based on **minor tremors and animal behavior.** People slept outdoors and many lives were saved. However, this kind of success is rare. The next large Chinese quake struck **without any warning,** resulting in tens of thousands of deaths.

No, neither the USGS nor any other scientific organization has ever predicted a major earthquake. We do not currently know how to do so, and we do not expect to gain that ability in the foreseeable future. USGS scientists can only

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calculate the **probability** that a significant earthquake will occur in a specific area within a certain number of years.

An **earthquake prediction** must include three elements:

1. The date and time,
2. The location, and
3. The magnitude.

Yes, some people claim they can predict earthquakes, but their statements are **not scientifically valid** for the following reasons:

1. Their claims are not based on scientific evidence, and earthquakes result from geological processes—not phenomena like clouds, bodily aches and pains, or slugs.
2. They do not define all three elements required for a valid prediction.
3. Their predictions are overly general, ensuring that at least one earthquake will appear to match. For example:
   (a) "There will be a magnitude 4 earthquake somewhere in the U.S. in the next 30 days."
   (b) "There will be a magnitude 2 earthquake on the west coast of the U.S. today."

If an earthquake occurs that even vaguely fits their prediction, they often claim success—even if the timing, location, or magnitude is drastically different—making it a **failed prediction.**

These predictions (usually by non-scientists) often **spread on social media** after events believed to be precursors to earthquakes. These so-called precursors include:

- Swarms of small earthquakes
- Elevated radon levels in water
- Unusual animal behavior
- Increasing magnitudes in moderate events
- A rare moderate quake interpreted as a possible foreshock

Unfortunately, most of these phenomena occur frequently **without** being followed by a major quake. Hence, a **true prediction** is not yet possible. At best, scientists can make **probabilistic forecasts** based on data.

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An earthquake forecast was made in **China** several decades ago based on small tremors and unusual animal activity. Many people slept outdoors and were spared when the main quake struck, causing widespread destruction. However, **this type of foreshadowing is rare**, and most earthquakes occur **without any warning signs**. The next large quake in China had **no precursors**, resulting in the deaths of thousands.

The **USGS** focuses on **long-term hazard mitigation**—such as improving structural safety—instead of pursuing short-term predictions.

There is a 100 percent chance of an earthquake today. While many people may never experience one, earthquakes are very **common on Earth**. Somewhere on the planet, an earthquake will occur today. It may be so light that only instruments detect it, or strong enough to cause property damage, injuries, or death. Around **700 earthquakes per year** are potentially destructive if they occur near populated areas, though most happen far from civilization.

Most of the world's earthquakes occur along the **"Ring of Fire"**, or the **circum-Pacific belt**, making it today's most probable earthquake zone. But no region is entirely free from earthquakes.

Saying an earthquake will occur today is not **predicting** anything—it's a **statistical certainty**. Several **million earthquakes** occur annually, thousands per day, though most are too small to be detected without instruments. The **real challenge** lies in **predicting** when and where a **damaging** quake will occur. Earthquake prediction **may** become possible someday—but only after much more is learned about the process.

10. Indian Scenario

Mr. J.L. Goutham, Scientist E at the National Centre for Seismological Research (Ministry of Earth Sciences), has published 16 articles and participated in real-time earthquake monitoring, micro-earthquake surveys, and aftershock analysis. The **India Meteorological Department (IMD)** has established **84 monitoring networks** from **Kashmir to Thiruvananthapuram** for data dissemination.

H. Goswami and colleagues from **Gauhati University** attempted to correlate **rainfall anomalies with earthquake occurrence** in India. Their findings are published in the *Indian Journal of Radio and Space Physics*:

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Dr. Shanker, Assistant Professor at **IIT Roorkee**, is involved in **earthquake engineering** and **landslide precursor studies**.

Dr. M.L. Sharma was elected Fellow of the **Indian Geophysical Union** in 2014 and chaired a session on seismic hazards. He is also Convener of the **BIS Subcommittee on Seismic Microzonation**.

Prof. B.K. Maheshari (IMS) works on **soil liquefaction potential during earthquakes**.

Dr. Ravi Sankar Jakka, Assistant Professor at IIT Roorkee, received the **'Young Geotechnical Engineer Best Paper Award'** from the Indian Geotechnical Society in 2014.

Prof. D.K. Paul chairs the **DST Working Group on Delhi Seismic Microzonation** and serves on multiple national disaster and seismic monitoring committees.

Despite robust research in India by **Earth Science institutes, IITs**, and **Geological Survey of India (GSI), coordinated prediction efforts** are **rare** and mainly claimed by **non-academic individuals**, often based on **intuition** rather than science.

Remote Sensing & Climate Impact

Dr. Jeganathan Chockalingam, Dept. of Remote Sensing, **Birla Institute of Technology, Mesra**, works on **vegetation dynamics** using **remote sensing** and **RS-GIS** tools. His interests slightly align with earlier works of **Dr. Prakash**.

The study assesses **climate impacts on vegetation health** and projects **drought severity** in **2050 and 2070** using **MODIS NDVI and LST data**, GCM projections under **RCP 8.5**, and **CHIRPS precipitation**.

Key findings:

- Mean LST may rise **by 10°C** from 2017 to 2070.
- In 2017, only **2.98%** of the total geographical area (TGA) was mildly affected.
- By 2050: **6.85%** under extreme drought; By 2070: **7.46%** under extreme drought.
- Moderate drought will impact over **25–29%** of the TGA.

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- Severe drought zones are projected to **decrease** (from 31.10% to 26.38%).

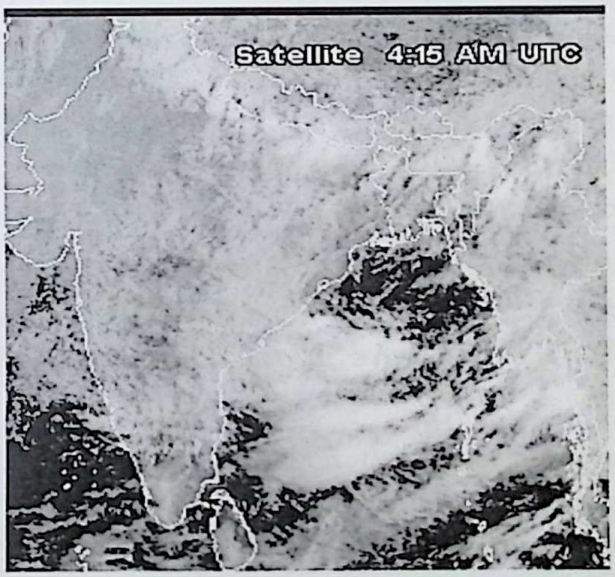
Southeastern and northwestern parts of the study area will be most vulnerable to future climate changes.

Planetary Alignment & Earthquake Hypothesis

A bold conceptual study explored **gravitational interactions from planetary alignments** as indirect triggers for earthquakes. It proposed:

- Major planets (Jupiter, Saturn, Uranus, Neptune) create **Invisible Resultant Gravity Vectors (IRGVs).**
- When inner planets like Earth, Mercury, or the Moon intersect these IRGVs, **major earthquakes (>M6)** may be triggered.
- The study analyzed **10 planetary configurations**, linking them with significant earthquake events.
- **Mercury and the Moon**, due to their fast orbits, may act as **catalysts.**
- Based on this hypothesis, **sensitive days** in 2016 were predicted for validation.

While **controversial**, the study attempts to introduce a **new perspective** on the relationship between **gravitational anomalies and seismic activity.**



Prakash's Prediction

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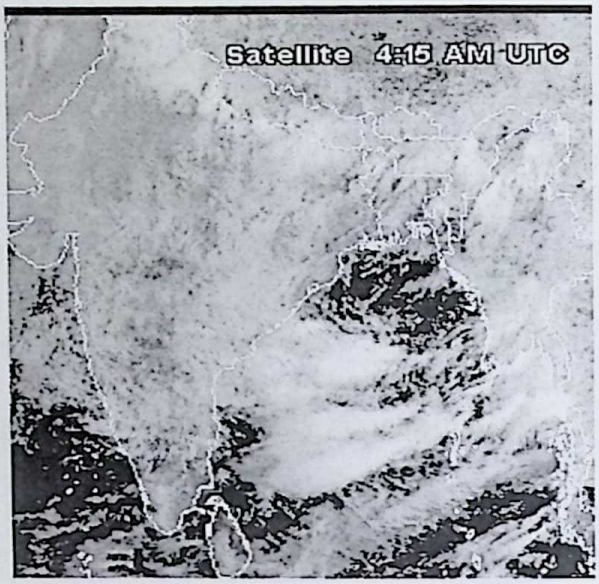
Whenever Mr. S. Prakash comes across an anomaly, he makes a genuine effort to warn the concerned areas through emails and newspaper articles.



This note is in reference to an article published in *Nature*, which, according to Mr. Prakash, contains inaccurate information.

"The latest study won't be the final word on aftershock forecasts," says Gregory Beroza, a geophysicist at Stanford University in California. *"For instance, it doesn't take into account a type of stress change that happens as seismic waves travel through the Earth. But this paper should be viewed as a new take on aftershock triggering. That's important, and it's motivating."*

"We've really just scratched the surface of what machine learning may be able to do for aftershock forecasting," adds Phoebe DeVries, a seismologist at Harvard University, Cambridge, Massachusetts. She and her colleagues published their findings on August 29 in *Nature*.

Mr. Prakash emphasizes that both the magnitude 7.1 and magnitude 6.3 earthquakes must have had separate atmospheric precursors. He claims to have issued timely warnings for both earthquakes, yet his methodology was dismissed without careful evaluation by journal editors and experts.

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He expresses concern that prestigious journals like *Nature* and *Nature Geoscience* have promoted incorrect information and observational conclusions related to earthquakes, while overlooking legitimate warning signals.

"Natural events never differ from one observer to another. I have submitted my findings and data multiple times. I hope that someone, at least, will consider them seriously. After all, my completed work could benefit all of humanity and provide a viable solution to the centuries-old problem of earthquake prediction," says Mr. Prakash.

He also refutes claims about aftershock timelines:

"The observation that aftershocks can occur more than five months after a main event is incorrect. Please refer to the attachment for clarification."

He cites a case study:

A magnitude 7.1 earthquake near Christchurch, New Zealand, in September 2010 did not cause any fatalities. However, a magnitude 6.3 aftershock that occurred more than five months later and closer to the city center resulted in 185

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Whenever Mr. S. Prakash comes across an anomaly, he makes a genuine effort to warn the concerned areas through emails and newspaper articles.

This note is in reference to an article published in *Nature*, which, according to Mr. Prakash, contains inaccurate information.

"The latest study won't be the final word on aftershock forecasts," says Gregory Beroza, a geophysicist at Stanford University in California. *"For instance, it doesn't take into account a type of stress change that happens as seismic waves travel through the Earth. But this paper should be viewed as a new take on aftershock triggering. That's important, and it's motivating."*

"We've really just scratched the surface of what machine learning may be able to do for aftershock forecasting," adds Phoebe DeVries, a seismologist at Harvard University, Cambridge, Massachusetts. She and her colleagues published their findings on August 29 in *Nature*.

Mr. Prakash emphasizes that both the magnitude 7.1 and magnitude 6.3 earthquakes must have had separate atmospheric precursors. He claims to have issued timely warnings for both earthquakes, yet his methodology was dismissed without careful evaluation by journal editors and experts.

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"Natural events never differ from one observer to another. I have submitted my findings and data multiple times. I hope that someone, at least, will consider them seriously. After all, my completed work could benefit all of humanity and provide a viable solution to the centuries-old problem of earthquake prediction," says Mr. Prakash.

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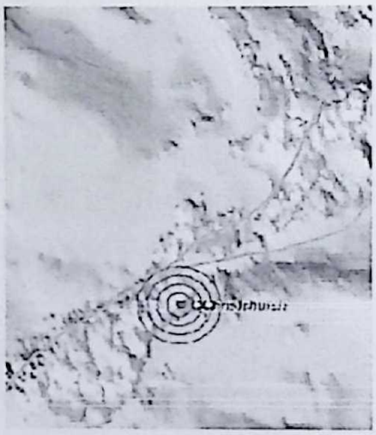
REGIONAL WEATHER CHANGES	RESPECTIVE REGIONAL QUAKES
Record snow fall for Mount Hotham Aug.24,2010 Mount Hotham (Victoria has recorded its highest August snowfalls in almost a decade.	Quake of M7.0-SOUTH ISLAND OF NEWZELAND (Christchurch),2010 September 03; Location:43.530°S, 172.120°E ;Depth:5km.
In the past seven days	
51 centimeters of snow have been recorded, taking the tally to 142 centimeters for the month. Wild weather hits Adelaide Hills ThuAug26, 2010 Strong winds and heavy rain overnight toppled trees and caused a landslide in the Adelaide Hills. Flood warning for north-east Victoria SunAug29, 2010 Heavy rain has caused significant stream rises in the Ovens, Buffalo and King River catchments near Wangaratta. The Ovens River is above minor flood levels at Wangaratta at 12.1 meters. Coldest Can berra winter in a decade Tue Aug 31, 2010 Canberra has experienced its coldest winter daytime temperatures in 10 years. Daytime temperatures averaged 12.6 degrees while overnight minimums averaged 2 degrees.	

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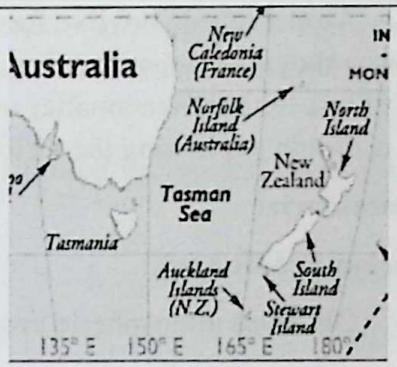
Victoria on flood watch as storms approach Sep. 3, 2010 Approaching storms could be the most significant weather event in Victoria for the past 15 years. A low-pressure system could bring rainfalls of up to 150 millimetres across the north-west, north and north-east overnight and tomorrow, and could cause flooding problems for months.	

During yet another discussion on a sharing from my student, I had a detailed conversation with him, which he readily accepted and said may be very useful in further converging our work.

Suppose you were driving underneath an eastward-moving thunderstorm at the same speed and in the same direction as the storm, so that you stayed under it for a few hours. From your point of view, it was raining the entire time you were driving. But from the point of view of people in the houses you passed, the thunderstorm approached, it rained really hard for twenty minutes, and then stopped raining.

The people in the houses formed a network of observers, and if they communicated, they would realize that the thunderstorm moved rapidly from west to east, raining on some houses while missing others. This point of view is called the **Eulerian description** because it follows the storm through a fixed set of locations. You, on the other hand, followed the storm; any changes you observed were due only to changes in the storm's intensity. Your point of view was a **Lagrangian description** because you stayed with the storm.

We can generalize these ideas to any **parcel of air**, not just a thunderstorm. An air parcel is a blob of air that more or less stays together as it moves through the atmosphere, meaning that its mass and composition are conserved as it moves. It has a fairly uniform composition, temperature, and pressure, and a defined velocity.

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Air parcels do not live forever. They are simply air moving within air, changing shape as they interact with other parcels and mix until they disappear. Larger parcels tend to last longer than smaller ones. Even though air parcels are temporary, they are very useful in explaining the difference between Eulerian and Lagrangian frameworks.

To summarize:

Eulerian Framework:

- Observes atmospheric properties and their changes at fixed points in space.
- Tracks motion by reporting observations over time.
- Is the method used for most weather observations and computational weather models.

Lagrangian Framework:

- Observes atmospheric properties and changes within a moving air parcel.
- Tracks changes inside the parcel as it moves.
- Is a conceptual or numerical approach, difficult to achieve with direct observations.

Here's an interesting fact: Radiosonde and soundings are considered Eulerian because they measure temperature and humidity at fixed locations. However, the **horizontal velocity** they measure—due to their lateral movement with the wind—is actually a **Lagrangian** measurement. A **cup anemometer** or **sonic anemometer** is an example of a **Eulerian** method of measuring wind velocity.

Some earthquakes predicted by him occurred exactly as forecasted.

All earthquakes, after all, tend to occur near areas affected by rainfall (a type of weather change), generally within 20° variation in geographic coordinates and typically within 15 days to a few weeks (2–4 weeks). In rare cases, they may occur after more than four weeks.

FOR THE YEAR 1983: Japan experienced deadly floods and devastating earthquakes.

In Masuda, Japan, massive rainfall and landslides occurred in 1983. On May 26, 1983, a magnitude 7.8 earthquake struck, accompanied by a tsunami at coordinates **40.462°N, 139.102°E.**

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Regarding the massive rainfall in Japan: Prime Minister **Shinzo Abe** cancelled an overseas trip to manage Japan's worst flood disaster since 1983, with several million people forced from their homes.

The **Japan Meteorological Agency (JMA)** issued its highest-level warning, referring to the event as **"historic" rainfall.**

Affected areas include:

- **Western Honshu, Japan:** 35.248°N, 135.388°E
- **Near East Coast of Honshu, Japan:**
  - 38.284°N, 142.144°E
  - 40.264°N, 142.724°E
  - 35–36°N, 141.191°E
- **Off East Coast of Honshu, Japan:**
  - 36–37°N, 143–144°E
  - 39.716°N, 143–144°E

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July01-02, 2018 **N Korea and S Korea (34-40N124-129E) (rainfall at 46 locations)** **'It could be the worst weather disaster to hit Japan in 35 years** Of the 47, thirteen prefectures on Japan's mainland received deadly amounts of rain. Hiroshima and Okayama, in the southern part of Honshu Island, were among the worst flooded areas. (40.45N 124.93E 76m) (38.71N 125.38E 47m) (38.03N 125.70E 81m) (39.98N 125.25E 99m) (38.15N127.30E155m) (39.18N 127.43E 36m) (38.25N 128.56E 19m) (37.96N 126.56E 70m) (36.76N 127.11E 22m) (36.21N128.00E245m)	July03,2018/M4.5 Shikoku, Japan;32.41N; 132.05 E. July02, 2018/M4.7Near S. coast of Honshu, Japan;33.73 N; 137.17 E. July 05,2018/M4.2 Near East coast of Honshu, Japan; 37.43 N; 141.47 E. July 07,2018/M5.9 Near East coast of Honshu, Japan;35.13 N; 140.65 E. July12,2018 M4.7 at 38.23 N; 142.22E July 08,2018/M 4.3 Kyushu, Japan;33.28N; 130.22 E.
(36.63N 127.45E 59m) (36.76N 126.50E 27m) (36.96N 127.95E) (37.26N 126.98E 35m) (37.33N 127.95E 151m) (37.48N 126.63E 70m) (37.90N 127.73E 78m) (37.88N 126.75E 31m) (36.33N 126.55E 19m) (37.56N 126.96E 86m) (36.36N 127.36E 72m) (37.26N 127.48E 91m)	July01-02,2018 NKorea and SKorea (34-40N 124-129E)(rainfall at 46 locations) 'It could be the worst weather disaster to hit Japan in 36 years July01-02,2018

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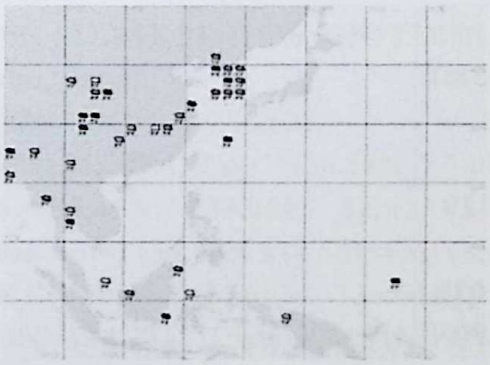
(37.90N 127.06E 112m) (37.68N 128.76E 844m) (36.11N 128.31E) (36.56N 128.71E 141m) (36.98N 129.41E 51m) (37.18N 128.46E 237m) (37.75N 128.90E 26m) (37.80N 128.85E) (37.50N 129.13E 37m) (34.68N 125.45E 83m) (35.98N 126.70E 31m) (34.73N 127.75E 67m) (35.81N 127.15E 55m) (35.16N 126.90E 74m)	NKorea and SKorea (34-40N 124-129E) (rainfall at 46 locations) July03-04,2018 SKorea and Japan(25- 37N 128-131E)
(35.55N 126.85E) (35.01N 127.36E) (34.46N 126.31E 477m) (34.81N 126.38E 39m) (35.41N 127.38E) (35.88N 128.61E 59m) (35.20N 128.11E 23m) (35.18N 128.56E 4m) (34.83N 128.43E 33m) (34.20N 129.30E 19m) **Japan** **(26.20N127.68E27m)**  **July03-04,2018** **SKorea and Japan(25-37N128- 131E)** **Hokaido** **(43.76N142.36E116m)** **(37.48N130.90E220m) (37.50N 129.13E 37m)** **(36.98N129.41E51m)**	

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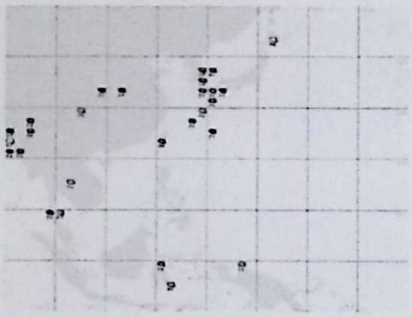
(35.55N 129.31E 35m) (35.10N 129.03E 70m) (34.20N 129.30E 19m) (34.83N 128.43E 33m) (32.70N 128.83E 26m) (32.73N 129.86E 35m) (33.58N 130.38E 15m) (33.56N 133.55E 5m) (31.55N 130.55E 31m) (31.93N 131.41E 15m) (28.38N 129.50E 7m) (26.20N 127.68E 27m) (25.83N131.23E20m)  **July05,2018** **Hokaido, Japan 43.05N141.33E26m) (42.80N140.23E38m) (41.81N 140.75E 43m) (40.81N 140.76E 3m)** **July 05,2018**	
China, Nr Ryukyu Isln, Japan(30- 34N 110-112, 114,117E) **(34.48N110.08E2063m) (32.06N 108.03E 674m) (32.95N 117.36E 22m) (33.00N 114.01E 83m) (30.70N 111.30E 134m) (31.16N 112.56E 66m) (31.18N 114.96E 59m)** **Ryukyu Isln, Japan (25.83N131.23E20m) (26.20N127.68E27m) (24.78N125.28E41m)**	

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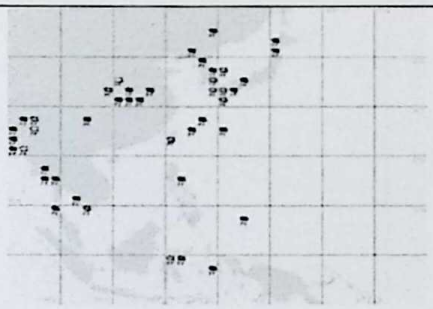 **July06,2018** **Hokkaido, Japan (42.80N 140.23E 38m) (43.05N 141.33E 26m) (41.81N 140.75E 43m) (42.98N144.38E39m) (43.33N145.58E39m)**	
China & N Korea (41.78N 126.88E 331m) (41.71N 126.91E 333m) (38.73N 128.18E 34m) **S Korea** **(37.26N 127.48E 91m) (36.63N127.45E59m)** **Honshu, Japan** **(36.58N 136.63E 33m) (36.66N138.20E419m) (36.38N 140.46E 31m) (35.45N 133.06E 22m) (34.40N 132.46E 53m) (34.06N 134.58E 6m) (35.45N 135.31E 22m) (34.68N 135.51E 83m) (35.48N 134.23E 15m) (34.31N 134.05E 10m) (35.16N 136.96E 56m) (32.73N 129.86E 35m) (33.58N 130.38E 15m) (33.56N 133.55E 5m) (33.83N 132.78E 34m)** **July 06,2018** **RyukyuIsln, Japan** **(24.78N125.28E41m)**	

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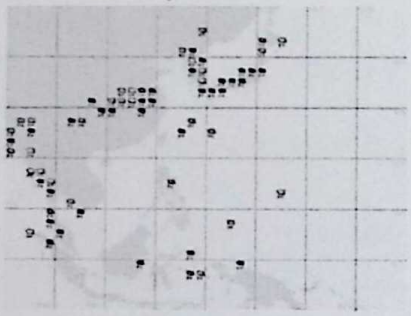
(24.33N124.16E7m)  **July07,2018** **Japan** **(39.71N 140.10E 21m) (37.38N 136.90E 14m) (36.58N 136.63E 33m) (34.40N 132.46E 53m) (35.45N 133.06E 22m) (35.45N 135.31E 22m) (34.06N 134.58E 6m) (34.31N 134.05E 10m) (35.48N 134.23E 15m) (34.68N 135.51E 83m) July 07,2018** **Japan S(31-33N129-131E) (32.73N 129.86E 35m) (33.23N 131.61E 13m) (33.58N 130.38E 15m) (31.55N 130.55E 31m) (31.93N131.41E15m)**	

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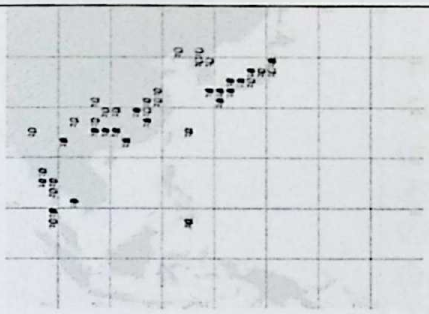
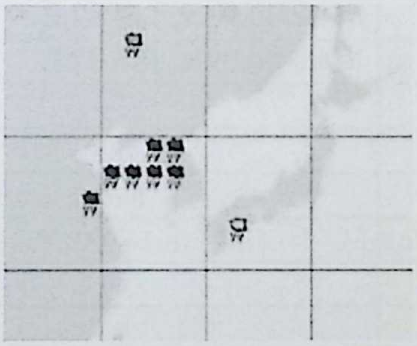


July10,2018
N&S Korea (37-39N126-127E)
(38.15N 127.30E 155m) (39.21N 126.65E 279m) (38.50N 126.53E 97m) (38.15N 127.30E 155m) (39.21N 126.65E 279m) (38.50N 126.53E 97m) (37.96N 124.63E 158m) (37.90N 127.06E 112m) (37.96N 126.56E 70m) China(36-37N121-122E) (36.76N 121.16E 64m) (37.40N 122.68E 47m)
SE Japan
(33.56N133.55E5m)



July11,2018

Hokkaido
(44.01N 144.28E 43m) (43.33N 145.58E 39m) (42.80N 140.23E 38m) (42.16N 142.78E 37m) (43.76N142.36E116m)

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N&S Korea (40.03N 128.18E 19m) (40.66N 129.20E 23m) 40.36N127.25E1080m) (40.16N 126.25E 155m) (40.45N 124.93E 76m) (40.08N 124.33E 13m) (38.73N 128.18E 34m) (38.41N 127.28E 352m) (39.18N 127.43E 36m) (39.93N 127.55E 22m) (38.50N 126.53E 97m) (39.21N 126.65E 279m) (38.03N 125.70E 81m) (39.03N 125.78E 36m) (39.61N 125.65E 27m) (38.71N 125.38E 47m) (38.51N 125.76E 52m) (38.15N 124.88E 6m) (39.98N 125.25E 99m)	
China	
(37.96N124.63E158m)	
(37.40N122.68E47m)	
(36.76N121.16E64m)	
July06,2018	July11,2018
Hokkaido, Japan (41-44N 140-145E)	Near East coast of Honshu, Japan
(42.80N140.23E38m)	M4.2/40.93N; 142.87 E
(43.05N141.33E26m)	M4.3/40.09N; 143.37 E
(41.81N140.75E43m)	
(42.98N144.38E39m)	
(43.33N145.58E39m)	
July11,2018	
Hokkaido	
(44.01N144.28E43m)	
(43.33N145.58E39m)	
(42.80N140.23E38m)	
(42.16N142.78E37m)	
(43.76N142.36E116m)	

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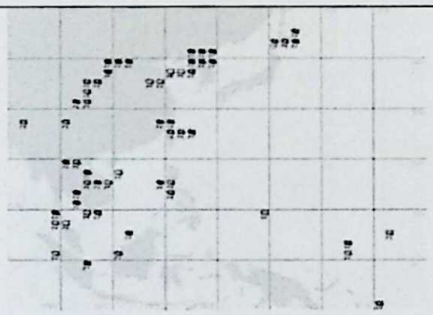
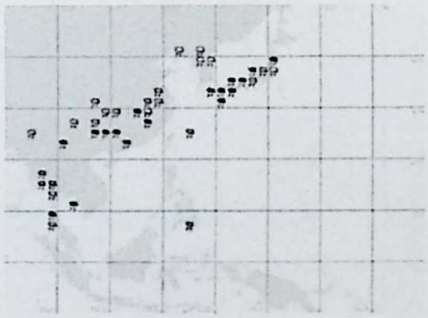


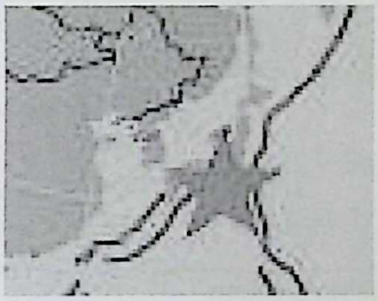
July13,2018
Japan N
(39.71N140.10E21m)

July07,2018
JapanS(31-33N129-131E) (32.73N 129.86E 35m) (33.23N 131.61E 13m) (33.58N 130.38E 15m) (31.55N 130.55E 31m) (31.93N 131.41E 15m)



July06,2018
RyukyuIsln, Japan
(24.78N125.28E41m) (24.33N 124.16E 7m)

July12,2018/M4.5Izu Islands,Japan;32.38N; 137.80 E.



July12,2018/M5.0(5.1)
Volcano Islands, Japan;
23.56N; 143.83 E.

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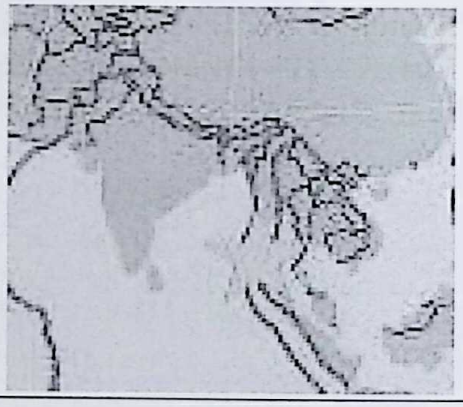
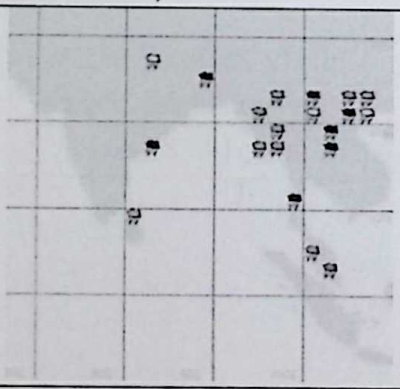
May02,2018 Then in southern state of Andhra Pradesh, meanwhile, was hit by more than 41,000 lightning strikes on May 02, 2018. Heavy rains accompanied by hailstorm and gusty winds wreaked havoc in several parts of both the Telugu states Telangana and Andhra Pradesh, on May03,2018	May 25,2018/ M 4.7 Andaman Islands, India; 10.88 N; 93.72 E. 
Visakapattinam	
(17.70N83.30E66m)	
	
May03,2018	May04,2018/M

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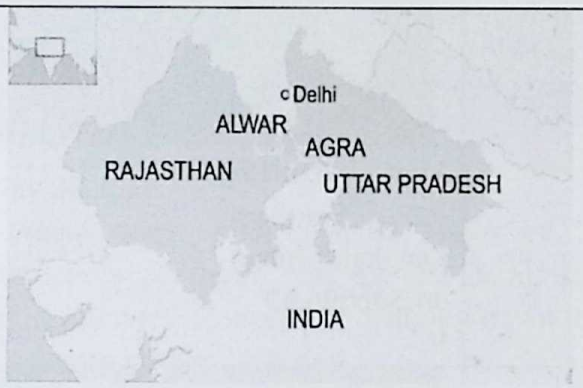
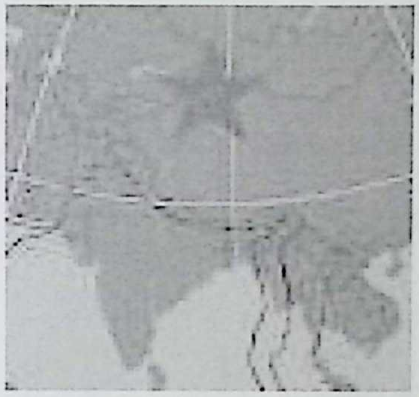
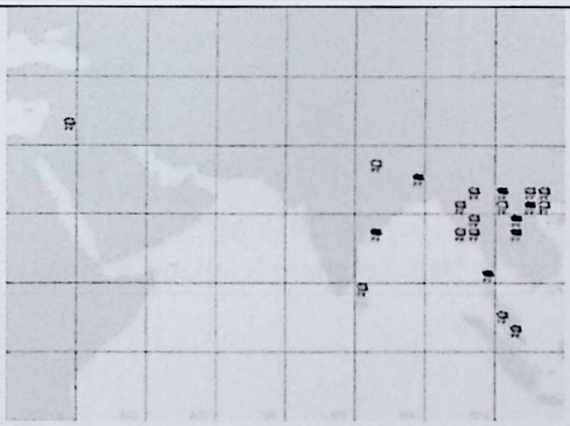
A devastating storm on May 03, 2018 worst in at least 25 years. At least 109 people have been killed and scores more injured hit the northern Indian states of Uttar Pradesh and Rajasthan.	4.2(43.89N; 86.44EM4.3on 6th May) Northern Xinjiang, China; 43.85N;86.58
	E.  May05,2018/M 4.1-4.4 Western
	Xizang;35.89N;
	88.81E.(28.29N ; 87.61 E on 10th)(32.72N; 83.89EonMay 15)(29.21N; 88.08EonMay 14)

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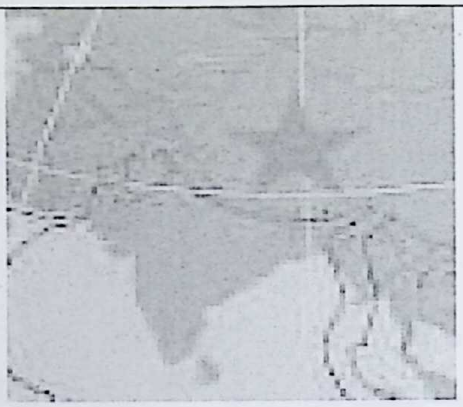
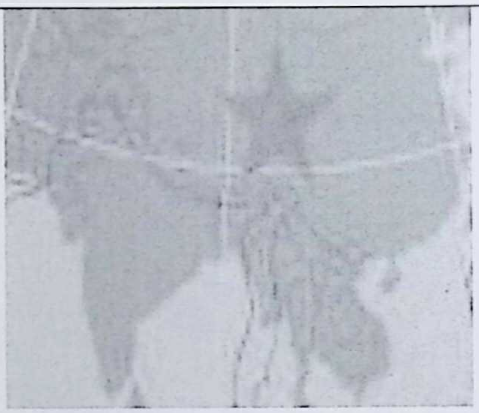
	 May 06,2018/M 5.2 Southern Qinghai, China; 34.56N;96.49 E.
	 May 08, 2018/M 4.8 Southern Xinjiang, China;

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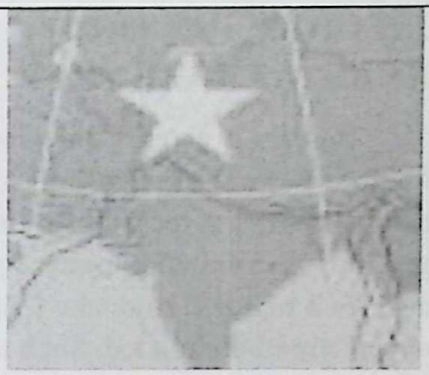
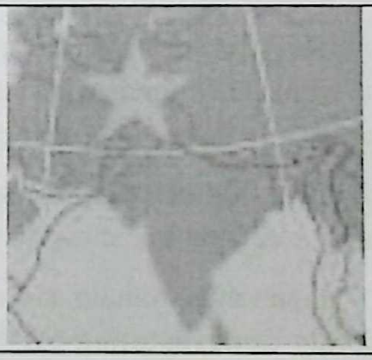
	 39.78N; 75.87 E.
May 08,2018 A dust storm, with a wind speed of 70 kilometers per hour, had hit the Delhi, last night followed by a squall, bringing down the temperature after a hot day.	May 09,2018/M5.1Pakistan; 33.26N; 70.52 E.
	May09,2018/M6.2(4.4on May 15) Hindu Kush region, Afghanistan; 36.98 N; 71.43E.
	

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HISTORIC RECORD RAINFALL ALWAYS FOLLOWED BY DEVASTATING EARTHQUAKES

Based on careful observation, it is both true and consistent that significant rainfall events are often followed by devastating earthquakes in nearby corresponding locations. With the record-breaking rainfall that began on **July 5, 2018**, and continued for **11 days across 13 Japanese prefectures**, it strongly suggests that the preparatory phase for a major earthquake (Magnitude 7–8+, possibly accompanied by a tsunami) may have been completed. Such an event is likely within the **third week of July**.

Please refer to the attachments, which show past observations where rainfall was followed by earthquakes in corresponding regions of Japan during the months of **May to July 2018**.

This is once again my repeated appeal: **Japanese authorities must remain on high alert.** There is no harm in taking preventive measures.

Historically, earthquakes tend to follow significant rainfall events (a major weather-related change) in nearby regions—typically within **20° variation in geographic coordinates**, and usually within **15 days to a few weeks (2–4 weeks)**. In rare cases, it may take **longer than 4 weeks**.

Example: The Year 1983

Japan experienced **deadly floods** and **devastating earthquakes**.

- In **Masuda**, Japan, **massive rain and landslides** occurred in 1983.
- On **May 26, 1983**, a **magnitude 7.8 earthquake**, accompanied by a **tsunami**, struck at coordinates **40.462°N, 139.102°E**.

Regarding the massive rainfall in Japan (2018): Prime Minister **Shinzo Abe** canceled an overseas trip to manage **Japan's worst flood disaster since 1983**, with **several million people forced from their homes**.

The **Japan Meteorological Agency (JMA)** issued its strongest possible warning, referring to the recent event as **"historic" rainfall**.

Japan must remain **extremely cautious** over the next **2–4 weeks** regarding the possibility of **devastating earthquakes of magnitude 7.0–8.0 or higher**, potentially accompanied by tsunamis, in the following regions:

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Western Honshu, Japan

- 35.248°N, 135.388°E

Near the east coast of Honshu, Japan

- 38.284°N, 142.144°E
- 40.264°N, 142.724°E
- 35–36°N, 141.191°E

Off the east coast of Honshu, Japan

- 36–37°N, 143–144°E
- 39.716°N, 143–144°E

Earthquakes **often occur after rainfall or snowfall** in corresponding regions. **Foreshocks have already begun** in the Honshu area. This is not a mistake—**be on high alert. Please do not ignore** this warning.

Please refer to the attachments for a list of locations where **deadly rainfall** was followed by significant earthquakes. The data strongly suggests that **devastating earthquakes are imminent** and may strike the **Honshu region.**

Also attached is **my photograph with Dr. Shanta,** Chairperson of the **Adyar Cancer Institute, Chennai, India,** where I have been receiving **treatment for lung cancer since 2015.**

This typical alert clearly indicates anomalies and potential locations where **earthquakes may be expected.**

July 2018

Regarding the heavy rainfall in Japan: *"It could be the worst weather disaster in Japan in 36 years."*

Japan needs to be extremely cautious in the next **2–4 weeks** for the possibility of **devastating earthquakes of magnitude 7.0–8.0 or higher,** potentially accompanied by a **tsunami,** in the following regions.

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6. Prakash Predictions Related Science:

Introduction:

Earthquakes are phenomenon that occurs only short term and the earthquake precursors have direct relation with earthquakes that are observable, which are testable as cause and effect. Earthquake prediction may be made very simple, free from false alarms and no way to say complicate or complex if the approach is applied. The ultimate aim of this manuscript is to predict earthquakes reliably by using simple laws of physics. The science of Physics has given us Kepler's second law of planetary motion, Centrifugal force and testing of tensile strength of materials which are excellent tools to understand the precursors of earthquakes. Gravitational force plays a vital role in keeping the entire Universe always in motion. The centrifugal force due to the orbital motion of the earth is the major driving force for tectonic plate motion. The centrifugal force keeps the tectonic plates always in motion. There are more than 250 epicentre zones and equal number of precursor areas that have been identified in this study. The Precursors used to predict earthquakes in this manuscript are directly related to earthquakes and can be measured easily. It is scientifically observed truth that the orbital motion of the earth with 23.5° tilt causes seasonal variations around different epicentre zones classified on the earth's hemispheres throughout the year. Every year when earth comes to particular position with respect to the Sun, tectonic plates of particular epicentre zones are set active and energized more; this causes the seasonal variations for a particular duration.

The tectonic plates under the influence of centrifugal force behave like testing of tensile strength of metal plate under load. Within the elastic limits the plates behaves in a way and vibrates. The onset of seasonal variation alters the limits of this elasticity of tectonic plates. During earthquake occurrence the limits are exceeded and the tensile stress is released both as quake and climate anomaly. While the accumulation of stress alters the climate and produce an anomaly the actual break observed as earthquake is estimated to occur afterwards. The Zones with or near the identified epicentres are vulnerable to such a discharge. During the tensile point stage, the ductile fracture of tectonic plates causes weather anomalies and at the break point stage, the brittle fracture of tectonic plates causes seismic anomalies. The time duration between tensile points to breaking point is the interval times of weather anomalies say rainfall or any climate

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anomaly event and the happenings of earthquakes. This time duration help us predict earthquakes in advance and take suitable disaster management activities in spite of the short term nature of earthquakes.

Our estimation experience suggests usually within 15 days of anomaly the earthquake occurrence is observed for a magnitude of 4 to 6 in the Richter scale. However, the time estimated for Japan 2011 earthquake doubled as the magnitude is greater than 8 R Scale. All form of atmospheric weather anomalies are directly related to precursors to earthquakes. Among them, rainfall is the best suitable precursor used in this manuscript to predict earthquakes. Based on the previous observation data of rainfall and the corresponding location of earthquakes, just on seeing the location and amount of rainfall (above 50mm) on a daily rainfall/ snow fall map as referred in this manuscript, the impending earthquake's epi-centre location can be fixed instantly, even less than a minute. Some of the observation data presented here with respect to location may not match with the existing prerequisites criteria to predict earthquakes, because an entirely new view point have been introduced here say frames– time frame, location frame and magnitude frame respectively. No instrument or equipment is used but can be used to verify and the method presented here is without the rigorous statistical or mathematical approach. Several earthquakes of M 4-6+ have been warned successfully based on the previously prepared observation catalogue as included in this manuscript.

Depths of earthquakes are not taken into consideration here as it requires further study.

The rainfall anomaly event strongly indicates the earthquakes likely to occur in 250 zones. However, some of the zones may coincide with similar classified zones and fault regions by earth stations. Rainfall anomalies and the resulting earthquakes locations at same locations for the past several years recorded are presented. So this method of earthquake prediction is more suitable for public information purposes and along with GPS based methods for exact location prediction may be used to forecast along with climate data.

Keywords: Orbital motion of the earth, Centrifugal force, epicentre zone, seasonal variation, atmospheric anomalies, seismic anomalies, earthquake prediction, tensile strength of seismic plates.

Global efforts to look for strategies that would save the world from the loss of

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priceless lives and materials due to uninformed Earthquakes are on the increase with the rapid advances in sensors and computation capabilities. Recent Feb17 2018 earthquake revealed that prompt warning has saved several lives at Mexico using cell phones, GPS and social media. The Chinese well predicted earthquake and subsequent action has saved large number of lives as early as in 1975. However, the same prediction strategy could not get similar result afterwards in 1976. On one side the cause for global warming is under study and better strategies are needed to save our planet from human activity. On the other side, earthquake like the one in 2004 in Java are a threat to mankind and drives it to search for better strategies to manage such huge natural challenges. Both gives our limitations and need for creating harmony with nature and our consciousness to love nature. Though there are several papers published on earthquake prediction but none is capable to warn successfully a single individual earthquake repeatedly. Its orbital motion of the earth with 23.5° tilt causes seasonal variations on the earth's hemispheres throughout the year. The paleo-climatalogists have tried to reconstruct the earth's temperature and climate during the dinosaurs indicating the surface temperature climate and geological evolution. Earthquakes are natural ground motions caused as the Earth unless huge energy that are created by the precursors. The science of earthquakes is seismology, "study of shaking" in scientific Greek. Earthquake energy is found to come from the stresses of plates and is termed tectonics. As plates move, the rocks on their edges deform and take up strain until the weakest point, a fault, ruptures, and releases the strain.

The seasonal variations are due to various factors like rotation and revolution of earth, the variation of gravitational forces due to moon and Sun. However the atmospheric weather anomalies; it is different for different places and different duration, depending upon the position of the earth with respect to the Sun. Orbital motion of the earth controls the overall mechanism that causes atmospheric seasonal variations in association with seismic activities. Earthquakes cannot be predicted, but they have some patterns. Sometimes foreshocks precede earthquakes, though they look just like ordinary earthquakes. But every large event has a cluster of smaller aftershocks, which follow well-known statistics and can be forecasted or at least expected.

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Prediction reliability:

Recent Delhi earthquake predicted became false and USGS has verified that it is false. The United States Geological Survey, a scientific agency of the United States government, says on its website that "neither the USGS nor any other scientists have ever predicted a major earthquake. USGS scientists have reported that they can only calculate the probability that a significant earthquake will occur in a specific area within a certain number of years. However, this study differs in that scenario and gives a strategy to predict earthquakes with in roughly a month time. If perfected this study will definitely bring an approach that can predict the exactly and precisely. Use of approximation techniques, monto-carlo functions and simulations may improve the predication reliability.

The study

An earthquake prediction must define three elements --the date and time, the location, and the magnitude. In this study we report a simple strategy that involves a flow chart that can aid us to predict the earthquake. The basis is physics of earthquake and climatology followed by two more data. Emphasis has been made toa few region where supportive data for correlation are available. However, the authors have data for almost all happened earthquakes since our first attempt. For more than 2000 years scientists have been searching for any little reliable signal or precursor proceeding to earthquakes to predict earthquakes. In this observation study observable earthquake precursors are found from an indirect source, on earth surface itself, no instruments, no equipment have been used to observe or monitor earthquake precursors. There are several attempts that are being made to predict earthquakes reliably with reliable pre-earthquake processes and pre-earthquake precursors. Already atmospheric weather precursor has been studied but failed in rigorous testing.

Naturally there is a strong relation between the centrifugal force, the force due to the orbital motion of the earth and the pre- earthquake processes. Generation mechanism of precursors is started with the orbital motion of the earth. Happening of earthquakes are not by chance but after a sequence of natural pre- earthquake processes. Hence, the sequence of pre-earthquake process is explored. In this observational study, more than 250 Kilometers precursor area and equal number of epicentre zones have been identified on earth's hemispheres. At particular position of the earth with respect

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to the sun, tectonic plates of particular epicentre zones are more active for a particular period are marked. Let us assume that, the massive amount of earthquake triggering process say a mantle– crust interfacial process that leads to frictional heat energy released through the faults region and released from the epicentre. This energy add to the normal causes of all form of weather like storms, cyclones, Hurricanes, typhoons, tornadoes, heavy rain accompanied with strong destructive winds, flood, heavy snow fall, freezing temperature, huge forest fires. This may create an anomaly for the respective season. In this pre-earthquakes mechanism sequence weather anomalies are the one stage previous to earthquakes so there must be a strong natural relationship with the earthquakes occurring at the epicentres closure to the anomaly.

Both the atmospheric weather anomalies and seismic anomalies usually originated from same source of tectonic plate motion. The centrifugal force causes relative interaction with the tectonic plates or micro plates motion. The interaction release massive amount of plate frictional heat that is carried by the wind in addition to the usual surface effect. The massive amount of frictional heat interaction with the atmospheric weather anomalies nearer to the zone at a **favorable region** which may are may not be the epicentre. The region where anomaly can be predicted may extend from + or – 250 kms with origin as . Sometimes adjacent epicentres may contribute for the climate anomaly and may confuse the prediction of the epicentres.

Every year the periodic seasonal weather change happens only at the corresponding same epicentre zones with the same duration. However, the locality decides the climate. With respect to the position of earth, intense plate activities around epicentre zone happens and the triggering energy accumulates below the fault and a part is conducted to atmospheric perturbations at least two weeks before earthquakes. Some important peculiarities, that is the epicentre zones are less than a mile to hundreds of miles away from the rainfall or precursor area. Results observed in this study are summarized and tabulated and included in this manuscript useful for future reference to predict earthquakes.

Earlier attempts

Herodotus (490 BC) recounts that stillness both precedes and creates earthquakes because the winds are bottled up in a cave. He has written "Everything is quiet, in fact everything is far too quiet. People get uncomfortable but they don't know

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why "Earthquake weather''. Varahamihra around 500 AD has recorded the earthquake and anomalous cloud and animal movements and behavior. Animals equipped with extra sensory power to sniff the weather in advance do have indicated that information's about the earthquake precursors initiation are attaining a critical point is available in advance. Though a great deal of research continues worldwide to predict short term earthquakes reliably but really they are unsuccessful. This prompted the group to look in for signatures. Few predictions were made and conveyed. Scientists are still not clear exactly how to relate weather anomalies with seismic anomalies and precursor area with corresponding epicentre zone. All earthquake events has had a cloudy weather. The excessive rain or climate anomaly has been observed in the faulty well established zones. However they were not correlated because of the fault zones and epicentres of expectations overlap for few events masking the eye of such predictors.

Our own failure to substantiate with relevant data has also been one of the main factor for misleading to our understanding. All rainfall events do not produce earthquakes and all earthquake events has a weather anomaly like anomalous rainfall or snowfall. Now a detailed investigation supports our prediction. The surface temperature records near the epicentres, the sudden change in ionic activity of the atmosphere also provide supporting data to our prediction strategy. This is not a paradigm of seeing a train every day. Whether we see are not the train moves every day.

The sequences of natural events before earthquakes are as follows:

Initiation with the orbital motion of the earth; Centrifugal force due to the orbital motion of the earth acting as the major driving force of tectonic plates of epicentre zones; massive amount of plate frictional heat liberated; atmospheric anomalies developed around faults due to the changes in the local dew point and mass above the crust of the epicentre zone and frictional heat weakening the plate strength tectonic plate fracture occurs as earthquakes. However, the released heat is absorbed by the atmospheric air and distributed by wind to a favorite H or Low pressure region L causing differences over land and sea. This is a natural radiation process. The air close to heated land rises above. However, the land is also heated by sun all around which is also a component of climate over the surface.

Precursor to pre-earthquake precursors:

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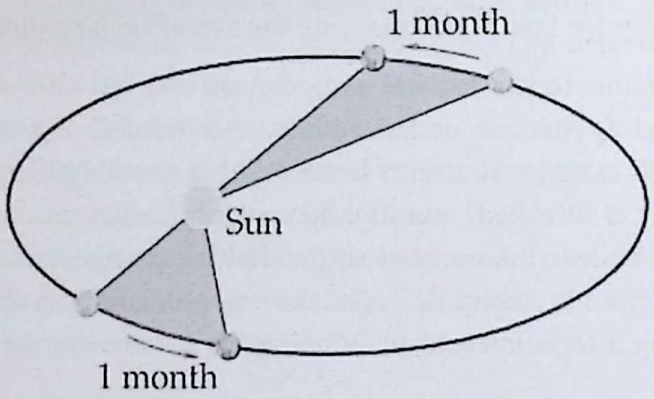
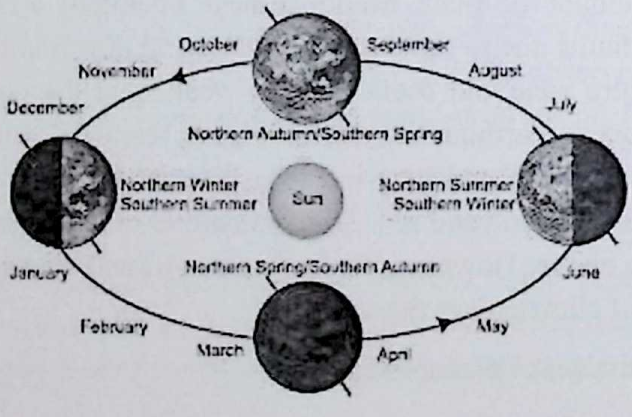
In the above sequence of natural events before earthquakes, one event is the precursor for the advance event. In this way tectonic plate motion is the precursor to atmospheric weather anomalies and the pre-earthquake precursors supply energy for creating the anomaly that can be measured by the climate data.

Inherently large events: The surface of the Earth is made up of nine major tectonic plates, 10 minor plates, and a much larger number of micro plates. These plates float on top of the viscous, the upper layer of Earth's mantle. Because of thermal changes in the mantle, tectonic plates are always moving. The fastest-moving plate, the Nazca, only travels about 160 millimeters per year.

1. Identification of centrifugal force, the major driving force for plate tectonics.



As the earth gets closer to Sun, it moves much faster in its orbit. This causes relative plate motions. There would be no seasonal variation on earth if there is no orbital motion with 23.5 tilt in association with plate motion.



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Where plates meet, they form a variety of different boundaries depending on the direction of their motion. Transform boundaries, for example, are formed where two plates grind against each other as they move in opposite directions. Divergent boundaries are formed where two plates pull apart from each other (the most famous example is the Mid-Atlantic Ridge, where the North American and Eurasian plates diverge). Convergent boundaries are formed wherever two plates move toward each other. In the collision, the denser plate is typically subducted, meaning it slides below the other. The earthquake processes are inherently large events but not complicated or complex in nature, they are always in correct order.

Large tectonic plates, large process of plate motion, large amount of liberations of plate frictional heat, provide large way of generation of atmospheric weather changes, generation of monster storms with potentially destructive energy cause heavy rain accompanied with strong winds, huge flood and devastating nature of seismic energy released. Even though events are inherently large but quite easy to observe and verify the correctness of the events are close to 15 days.

In the faults that extends few 100 km at a depth around 10-50 Km below the crust when the stress accumulates beyond a certain point called yield point the tensile point optimum is reached and when this tensile point exceeds a break point is reached. Between Yield point and tensile point stage, tectonic plates liberate massive amount of frictional heat that causes atmospheric weather anomalies; the interval between tensile point to break point, the massive amount of tectonic plate frictional heat weakening plate strength facilitate earthquakes.

To understand this let us assume a passenger travelling on a curved path and test the tensile strength of a steel plate. Let us assume that earth with tectonic plates as passengers travel in a train or bus on a curved path. Tectonic plate motion due to Centrifugal force is similar to the experience of passenger travelling in a train or bus on a curved path. Testing of tensile strength of a steel plate in a Universal Testing Machine is similar to tectonic plates under stress due to tectonic plate motion. The state of tectonic plate fracture, above an epicentre zone undergoes a progress by accumulation of energy to move beyond yield point; tensile point and break point. However, the the displacement is prevented by the centrepetal force which compensates

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partially.

During the period of yield point:

At yield point tectonic plates of epicentre zones are set more active. The initial plate motion is the pre-precursor to all other pre- earthquake processes. If the whole of energy is carried by the atmosphere and a heavy prolonged rainfall season is formed then nature has found a way to reduce the accumulation of more energy. If the accumulation process is still in progress and cannot be quenched then more and more energy gets accumulated and are released in unison as a massive earthquake of magnitude 5 around through the cracks in the known epicentres. Now we can see the previous history of earthquakes of that region and mark them as pre or post shock.

From yield point to Tensile part:

Generation of atmospheric anomalies around epicentre zone, due to the liberation of massive amount of plate frictional heat, weakening of tectonic plate strength facilitate brittle fracture of earthquakes. The strength of the tectonic plates is not a constant over these tectonic plate movements.

The most significant breakthrough:

Identification of centrifugal force, the major driving force to tectonic plates, identification of more than 250 epicentre zones and equal number of precursor areas and identification of pre- precursor process like pre-earthquake process are the most significant breakthrough of this observation study. While USGC , New Zealand and JA observations has a mapping of the earthquake zones some zones are not fitting our mapped zones but some zones overlap in certain regions. While there are two zones adjacent as in India, Indian Ocean, Java Sumatra regions, the anomaly region is missed in the data of one zone, as one zone in land and one zone in water. Hence the main part of the study is classification of zones to the identification of precursor to pre- earthquake precursors and seeing all overlapped regions in a single global chart or table of 250 zones.

Earthquake prediction criteria:

Observation results not match with the present-day criteria because of the classification of zones. However few data may match. For example with the USGC zones our prediction may have mid level correlation as the zones of USGC are much

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wider range.

Centrifugal force always keeps the tectonic plates in motion:

The orbital motion of the earth around the Sun determines and controls the overall plate motion at the corresponding epicentre zones. The duration of intense plate activities is depending upon the particular position of the earth. The position of the earth for a particular duration of time, during its rotation and revolution is responsible for the particular epicentre zones to exhibit atmospheric and seismic anomalies. The same phenomena observed prior to earthquakes in mainland, off coast and offshore earthquakes at different epicentre zones of earth's hemispheres year after year also vary.

The force due to the orbital motion of the earth, responsible for seasonal variation brings potential atmospheric and seismic anomalies. However, with varying severity level of processes for over 100s of years, seasonal weather and seismic activities has created some patterns which are altered slowly.

Classification of Zones:

Let us assume now that all form of atmospheric perturbations is triggered energy released by corresponding epicentre zone. Then each and every individual form of weather phenomenon is followed by seismic activities. Intense heat wave condition; heavy snowfall; tropical depressions and rainfall locations are followed by earthquakes. Among them rainfall location is the best and quickest to identify the impending earthquake location. In the daily rainfall /snowfall map the icon is the representative of the amount (>50mm) and location of rainfall and snowfall, however, rainfall location is the prerequisite requirements for earthquake prediction in this observational study. Epicentre zones are in less than a mile to hundreds of miles away from the rainfall or precursor area. With respect to the position ofthe earth, there are two processes naturally occurs at the respective epicentre zones due to tectonic plates motion - atmospheric and seismic anomalies. For example, for a particular position of the earth, only particular epicentre zones are atmospherically and seismically more active. When the earth moves to new position, a new set of epicentres are set to more active, so the previous epicentre zones are less active. However, all epicentre zones are always in active, so earthquakes of M<4 always occurs but not recorded here. The Global Seismic Hazard Assessment Program was a multi-year project sponsored by the United Nations that assembled the first consistent worldwide map of earthquake zones. The project was designed to help

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nations prepare for future earthquakes and take steps to mitigate potential damage and reduce deaths. These scientists divided the globe into 20 regions of seismic activity, conducted research and studied records of past quakes. However in this study further dividing the region is suggested with 250 zones and the fault zones with epicentres are mapped.

Pilot Study:

The Observations of atmospheric anomalies associated with earthquakes was first observed in Hindu Kush region, Afghanistan in the year 2008. Under similar atmospheric anomalies similar approach have been expanded to other parts of the seismically active regions. Recorded data details have been used for the same regions for different times. After continuous rigorous meticulous study and observation, it has been confirmed that earthquakes occur after all happen to the nearby places of rainfall. Significant progress have been achieved by this study, so similar approach have been applied to other regions to predict earthquakes reliably. There are specific latitude and longitude epicentre zone ranges on earth hemispheres. For every year, only within this epicentre range earthquakes occurs within or equal to 5° variation in latitudes and 15-20° variation in longitude from the location of rainfall.

The most seismically active areas are hundreds of miles away from the area where the rainfall is occurring sometimes making the link between cause and effect very difficult. Hence understanding the Zones of influence and pattern is very important. If we compare these to only 20 zones there may or may not be significant correlation.

For instance, the specific significant epicentre range for Honshu, Japan is 33-39N 139-142E. The earthquakes occurs only within this epicentre range, equal or within 5° variation in latitudes and 10-20° variation in longitude with respect to the rainfall (precursor) location range 31-40N 122-140E as from the record of past rainfall location. However, the corresponding epicentre location useful to predict future earthquakes of M>4 lies at Honsu and hence occurs at this region. From our understanding the epicentre releases the energy which is taken away by a quenching mechanism that causes precipitation or climate. When the excess energy is quenched and still more supply is available the processes compete until they reach equilibrium. When the equilibrium is reached and the precursors attained optimum the rest of energy appears

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as love wave and earth shake.

Criteria for earthquake prediction (observational):

Though there are several form of atmospheric weather anomalies, rainfall location is best suitable to assess and predict the exact location of impending earthquakes in the corresponding epicentre zone.

Amount of rainfall: greater than or equal to 50 mm; one or more days that are happening 15 days before earthquakes.

Magnitude frame: 4-6 on Richter scale (only on record weather changes the resulting earthquake magnitude 6 and above observed), depending on severity of weather and site geological condition.

Time frame (interval after rainfall): normally in 15 days and in exceptional case 2-4 weeks.

Frame (location): in all the normal cases within 10° latitude and within 20° longitude nearby rainfall location.

Epicentre depths are not considered significant and can be estimated later by other methods by ionosphere measurements or Radon content in water.

Epicentre direction: The location of storm formation and the direction of intense heat source from epicentre zones also may be considered.

Careful analysis of the seismic data reveals that anomalous atmospheric weather changes are always followed by seismic events in the nearby places, on sites wherever the geological condition favors. A relationship between atmospheric weather changes and seismic events do exist and have been reported and predicted by few earlier also with relevance to few countries and endeavors to develop a warning system based on anomaly in weather were also of considerable interest. However a clear route to predict in advance by observing the anomalous seasonal variations from the estimated season from the observed season has not been applied for many regions. Gosami et.al have calculated rainfall anomaly in certain earthquake regions in India and concluded that in few places the anomaly effect can be correlated with severe earthquake occurrence.

However, their calculations disagree at few places like Uttarkasi. The deviation has been attributed to distance of the location from sea shore. Their calculations have

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revealed the importance of geothermal energy in creating atmospheric anomaly."It may mean the thermodynamically favorable conditions for these storms are migrating pole ward. This study is first of its kind in predicting in advance many earthquakes of magnitude above 5 Richter's Scale. This claim that was considered groundbreaking led by University of Miami (UM) scientist Shimon Wdowinski shows that earthquakes, including the 2010 temblors in Haiti and Taiwan, may be triggered by tropical cyclones (hurricanes and typhoons), according to a presentation of the findings at the 2011 AGU Fall Meeting in San Francisco. They have also stated that the tropical cyclone precipitation will be stronger when sea-surface temperatures are higher, but are not clear whether the stronger precipitation is associated with higher intensity rates or vice versa or both. This study showed that if the sea-surface temperatures are uniformly higher around the cyclone region, the cyclone sizes will be similar to the affected tropical zone. Such studies do indicate a possibility of triggering by weather they have concluded. However, this paper denies such logic that weather triggers earth shakes. Instead we assume the reverse that the precursors to the earthquake triggers weather as well as earthquakes.

Researchers analyzed 1,142 tropic cyclones worldwide by using high resolution space-borne radar and microwave measurements of precipitation aboard NASA's Tropical Rainfall Measuring Mission (TRMM) satellite and tropical cyclone track data from the International Best Track Archive for Climate Stewardship 22 program. They investigated the controlling factors of each of the tropical cyclone sizes and found that the relationship of the cyclone sizes with the intensity of the cyclones, combined with the absolute values of SSF together are weak, but the relationship between the relative values of the SST and the cyclone sizes is strong. However, this research was conducted in the context of climate change, and their findings helped us to understand what controls the sizes of these storms and what measurement are needed for better prediction, they have tried to provide a relationship.

Different web sites provide different information on weather, and other very useful information about the location of rainfall; the storm history and satellite images gives cloud data and could be monitored over the epicentre area with ease. Whenever an anomaly is observed the extent of anomaly can be correlated with the energy expected for this anomaly. An empherical relationship do exists between weather anomaly and earthquake site up to a certain distance and this zone of influence may be

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estimated and complimented with other warning systems like Tsunami warning systems, Hurricane warning systems to enable the direction of mass movements and evacuations for disaster management teams.

Most earthquakes happen at the nearby places of rainfall event up to 20° variations in geological coordinates, usually in 1- 15 days to few weeks (2-4) and only in few cases it takes more than 4 weeks. Just on seeing a rainfall indication above 50 mm on a weather map we can expect future earthquakes of magnitude 4-6 may be on the horizon to the nearby places of rainfall. Earthquake of magnitude above 8 will come only to the nearby places of incredibly unexpected historic weather changes. The confident level of happenings of earthquakes to the nearby places after weather changes is 100% with the variation in expected precise location(depends on the location of origin of weather changes, eg. a cyclone can move thousands of kilometer away from its origin) and magnitude (severity of weather also depends site geological condition). An analysis performed for E Turkey region has been published earlier by Prakash. This paper deals extensively on the rainfall, Snowfall and Snow storm anomaly, its occurrence and the earthquake event that is predicted in the epicentres and also deals with geological coordinates in detail. A detailed strategy needed in future with a flow chart is provided in the figure.

Prakash Limit: After a careful analysis of the various data on the assumption that the earthquake precursors generate more energy that was used for creating a rainfall 49 mm is considered as Prakash limit.

The chaotic atmospheric effects may be negligible and assuming only the geothermal energy release from the known epicentres control the atmosphere the Principal author has observed that an anomaly above Prakash limit of rainfall will necessitate us to use this early warning system. When rainfall is 50 mm the anomaly is 1mm. Then the strategy shown will indicate a warning of earthquake of 4 magnitudes near the nearest epicentre location. The disaster assessment team can be alerted to plan their own strategies in advance or use stand II alerts whenever such symptoms arise in the vicinity of nearest known epi centres. If the centre lies in ocean then may be linked to Tsunami warning system. When the factor $X< 50$ we can expect a earthquake between 4-5 Richter scale. When anomaly in rain fall exceeds and or accompanied by extreme heat wave emission leading to forest fire then the magnitude is between 6 to 7

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Richter. When anomaly exceeds 50, heavy snowfall and major change in the ocean tides leading to Tsunami are noticed the magnitude expected may be greater than 7 Richter scale. The time lag between weather anomaly notice and occurrence of earthquake and arrival at epicentre may be 10 to 15 days.

World of precursor area and the corresponding epicentre zones have been summarized and presented in the supplementary data. In these area both the rainfall and the earthquakes happen repeatedly and in recurrent pattern.

Results are presented in two sets of tables. In the first set of tables images of daily rainfall star icons representative of coordinates of rainfall location and amount (>50mm) and the happenings of earthquakes in the corresponding epicentre zone. It confirms the relation between rainfall and earthquakes. The predictions are presented in the tables and 100 percent expected earthquakes has happened at the epicentres.With more intense study and application of statistical tools it is possible to approach a perfect detection of magnitude and time.

Japan 2011 Sendai Earthquake analysis:

The 9.0M earthquake hit Sendai on the end of winter season, on March 11st, 2011, which led to the death of 14,435 people, injured more than 5,314, and damage 76,713 houses (totally collapse). Sendai has a moderate, specifically humid temperate zone (Koppen *Cfa*), when winters season are cool and relatively dry, with January averaging at 1.5°C, February averaging at 1.7°C, and March averaging at 4.5°C. The early winters come on December with averaging high temperature at 4.3°C. This surface temperature high anomaly confirms our assumption that the surface anomalies originate beneath the earth that may correspond to precursor of earthquake. Normal average1.5°C has been exceeded 200%. This causes a heating of the air over epicentres and movement of air vertically.

The conditions favored our understanding of the earth and the phenomena on the surface keep growing with the expanding of satellite imagery technology. Land Surface Temperature (LST) maps generated from thermal images of LANDSAT TM and ETM+ datasets can be used to monitor the Earth's thermal regime for any change that might be induced by an earthquake. The thermal channels of the sensor of LANDSAT satellites were used to study the LST for Sendai to look for any change in the thermal character of Tohoku Region, Japan, induced by the earthquake of March

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11st 2011 and its aftershocks. Our analysis on the time series LST maps, a thermal anomaly was seen building up on the day of December 6, 2010. This anomaly showed a maximum rise on the day of March 12, 2011, just a few hours after the main shock. The earthquake occurred on March 11, 2011. A more intense anomaly was seen to persist towards the west of the epicentrum parallel with the Shikaochizaka fault, the Dainenjiyama fault, and the Nagamachi-rifu fault. This anomaly faded finally with the disappearance of the aftershocks (April 5th, 2011).

Temperature during December 6, 2010 was at 4°C, on this day the weather was normal without a precipitation and snowfall (figure. 2). Temperature on February 24, 2011 was at 2°C, on this day the weather was cloudy and there was a presence of fog (figure.3). From satellite imagery analysis on February 24, there was concentration of heat on the land surface, coincide with the three fault trace location. Temperature for March 12nd, 2011 is at 3°C, in this day the weather was sunny but cold (figure. 4), time acquisition of the imagery on this day was just a few hours after big earthquake. From the thermal image we found that there was an increase of land surface temperature, covered almost all of the Sendai City (the blue color on the image is cloud cover). The post earthquake April 15, the temperature was at 10°C, on this day the weather was normal, there was no precipitation event and warmer than the other observation date (figure. 5). The thermal image show us in this day the land surface temperature gradually decrease from the near coast, but there was appearance of heat, the orientation and location of the thermal anomaly, was seen to surface, consistent with the spatial orientation of three fault trace.

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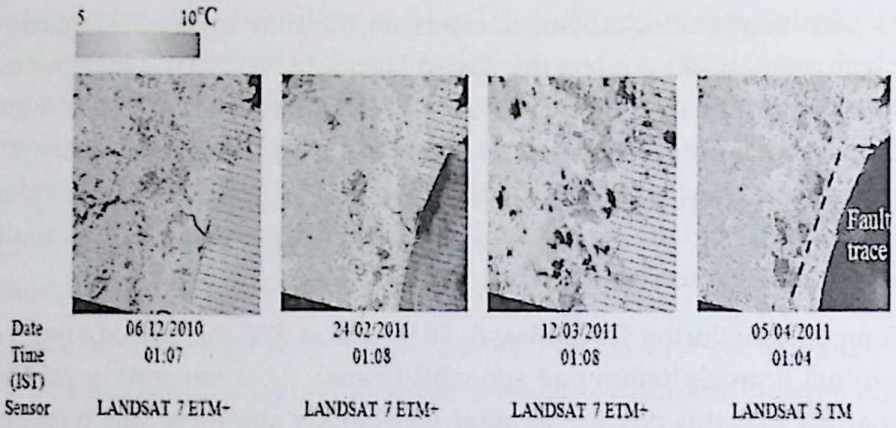

Figure 1. Land Surface Temperature Anomaly of Sendai City

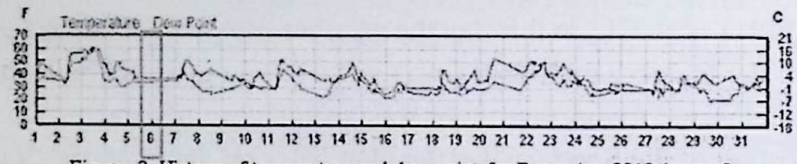

Figure. 2. History of temperature and dew point for December 2010 (normal)

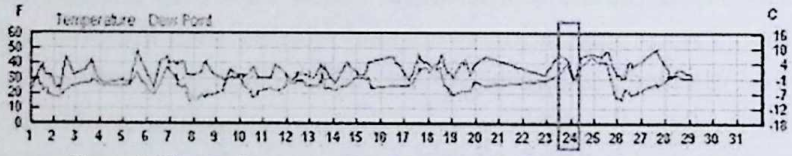

Figure. 3. History of temperature and dew point for February 2011 (normal)

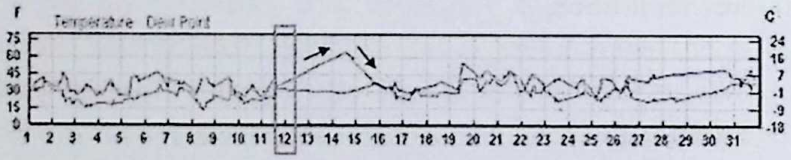

Figure. 4. History of temperature and dew point for March 2011 (anomaly)

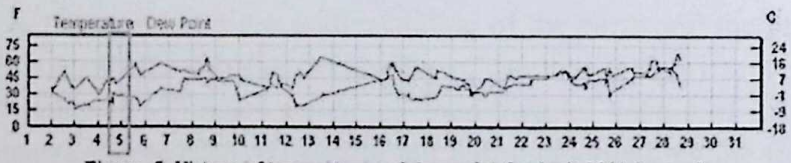

Figure. 5. History of temperature and dew point for April 2011 (normal)

Figure 4, shows that the trend of temperature was increase after the big earthquake (from March 13 to March 15), and had been decreasing since March15 to

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March16. This is showing us that it could be the two plates (Pacific Plate–North American Plate) gradually began to release the stress, with the presence of more than hundreds aftershock event. This indicates major energy is released in the earthquake.

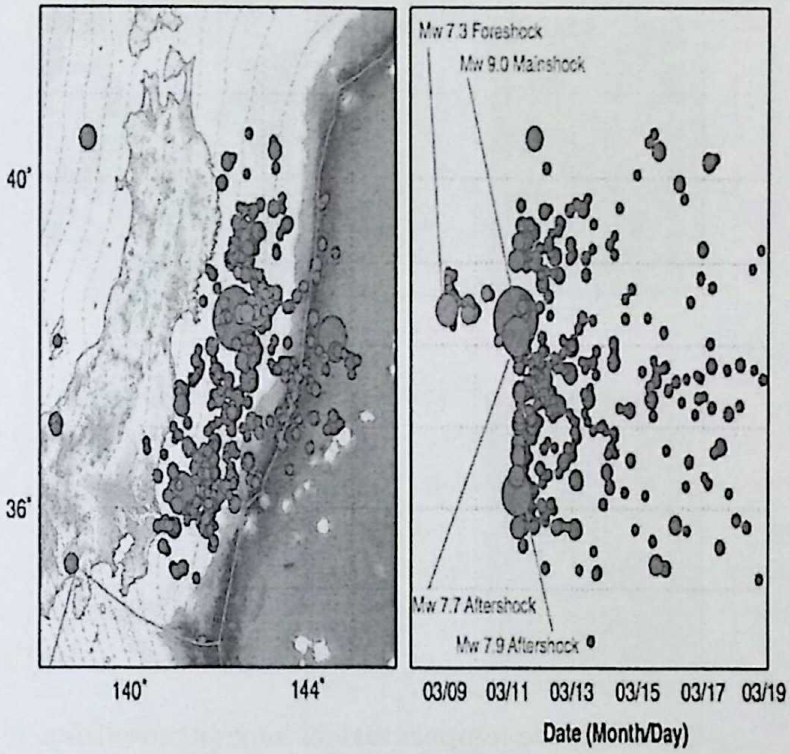

Figure .6 (Source:earthquake.usgs.gov)

The time series of land surface temperature anomaly of Sendai City was seen consistent with the spatial orientation of the Shikaochizaka fault, the Dainenjiyama fault, and the Nagamachi- rifu faul trace. The location of the thermal anomaly, which was seen to surface as a prelude to earthquakes. Then we compared the Landsat result with Terra/MODIS Land Surface Temperature and Land Surface Temperature Anomaly at day and night on March 2011. We found the anomaly behavior along the east-north side of Honshu Island at daytime.

Land surface temperature is how hot or cold the ground feels to the touch. An anomaly is when something is different from average. These maps show where Earth's

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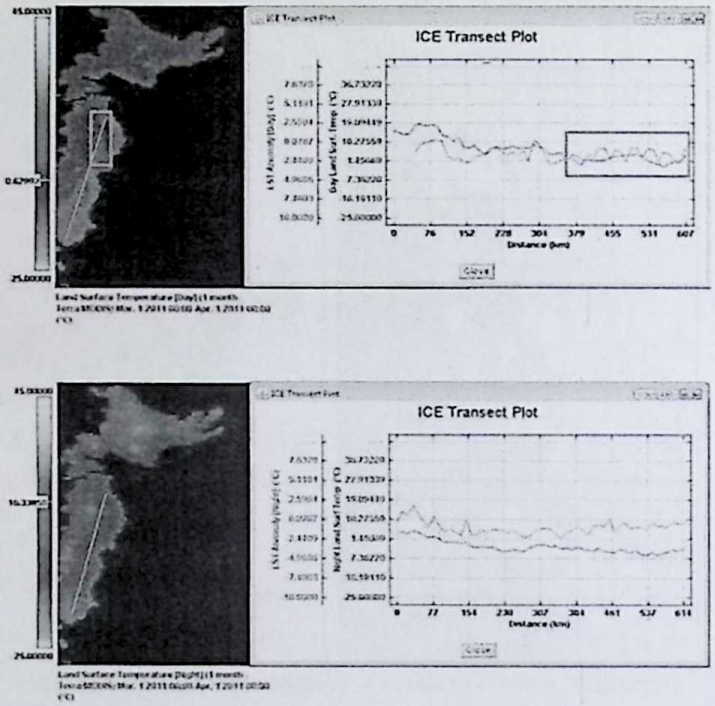
surface was warmer or cooler in the daytime and nighttime than the average temperatures for the same week or month from March 2011. So, a land surface temperature anomaly map for March 2011 shows how that month's average temperature was different from the average temperature for all Marches between February and April 2011.



Land Surface temperature in normal condition

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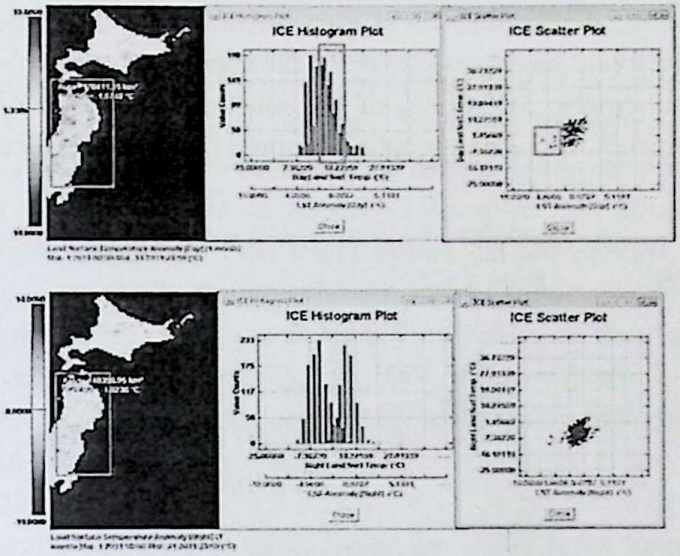
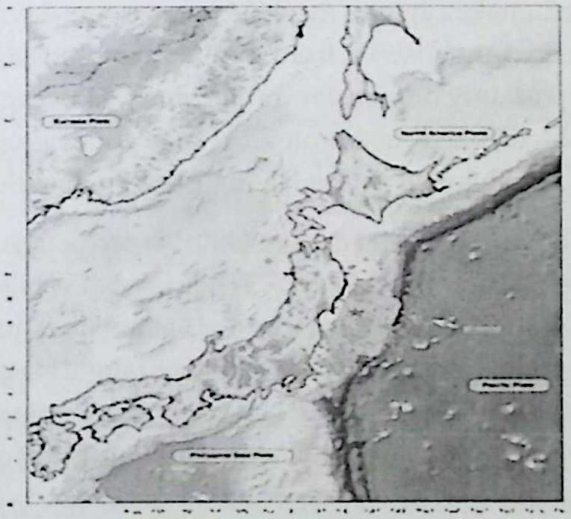


Land Surface temperature at anomaly condition

The 9.0M earthquake on March 11, 2011, which occurred near the northeast coast of Honshu, Japan, resulted from thrust faulting on or near the seduction zone plate boundary between the Pacific and North America plates. At the latitude of this earthquake, the Pacific plate moves approximately westwards with respect to the North America plate at a rate of 83 mm/yr, and begins its westward descent beneath Japan at the Japan Trench.



(Source: earthquake.usgs.gov)

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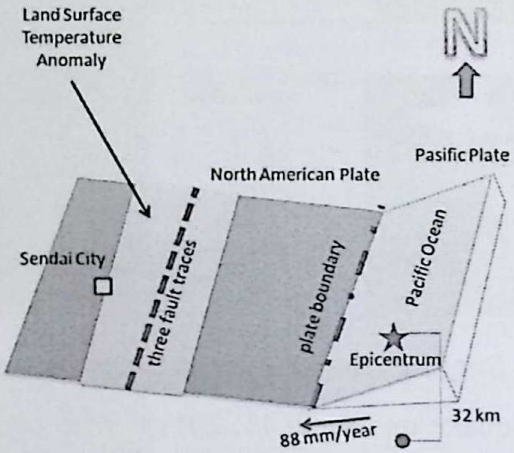
The location, depth, and focal mechanism of the March 11 earthquake are consistent with the event having occurred on the subduction zone plate boundary. If we trying to make schematic 3D model of the subsurface location of March 11, 2011, earthquake epicentrum, focus and location of three faults, it could be like the following figure.8



Schematic 3D model of of the subsurface location of 11 March 2011 earthquake, focus and location of three faults. (Adopted from: Saraf and Choudhury, 2005)

The 11 March 2011 earthquake was preceded by a series of large foreshocks over the previous two days, beginning on March 9 with a 7.2M event, and continuing with another three earthquakes greater than 6M on the same day. Due to the availability of satellite data, we can only observe from 24 February and March 12, 2011. Day by day observation is importantly needed for further study. However, this early study need more analysis of geological and meteorological time series ground data of the Sendai City to understand the earthquake that induced thermal anomalies.

Our Findings on Japan Sendai earthquake also predicts excessive rainfall during January 1-6 which was greater than 50 mms. The rain fall was torrential and extended up to 120 mm. This extended discharge through anomalous precipitation delays the earthquake process considerably. Usually the heavy rainfall lasts one or two days and we can expect an earthquake in two wreaks in the adjacent epicentre area. However, in the Japan earthquake during 2011 at Sendai the event occurred on March 2011.

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International Scenario:

The atmosphere above the epicentre of earthquake in Japan underwent unusual changes in the days leading up to the disaster, according to preliminary data. Dimitar Ouzounov, a professor of earth sciences at Chapman University in California. The theory, which in science circles is called "Lithosphere-Atmosphere- Ionosphere Coupling mechanism," goes like this: Right before an earthquake, the stressed fault releases more gases, especially the colorless, odorless radon gas. Once in the upper-atmosphere ionosphere, the radon gas strips air molecules of their electrons, splitting them into negatively charged particles (the free electrons) and positively charged particles. These charged particles, called ions, attract condensed water in a process that releases heat. And scientists are trying to detect this heat in the form of infrared radiation and predict earthquake. They are still of the view that it is a long way. They looked at what the atmosphere was doing in the days before the Japanese quake. They found that the concentration of electrons in the ionosphere increased in the days before the earthquake, as did infrared radiation. March 8, three days before the quake, was the most anomalous day. The researchers have crunched data for more than 100 quakes in Asia and Taiwan, Ouzounov said, and have found similar correlations for earthquakes with magnitudes bigger than 5.5 and depths less than 31miles (50 kilometers).The team is now working to involve researchers in Japan and worldwide. Terry Tullis, an emeritus professor of geological sciences at Brown University, want to put together a workshop between earth scientists and atmospheric scientists to discuss the research on the ionosphere changes.

On 6 April 2009 an earthquake devastated the Italian city of L'Aquila. Dr Rachel Grant of the Open University noticed that 96% of this large and actively breeding colony of todes had suddenly disappeared. Five days later the earthquake struck, after which the turtles did not reappear for a further five days. According to Grant "Our findings suggest that toads are able to detect pre- seismic cues, such as the release of gases and charged particles, and use these as a form of early warning system". Roger Bilham of the University of Colorado in Boulder and Rebecca Bendick of the University of Montana in Missoula poured some light on the link between earth's rotation and seismic activity. Bilham, in conversation with the *Observer* last week, said there isa strong correlation between the earth's rotation and seismic activity. "The correlation between Earth's rotation and earthquake activity is strong and suggests there

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is going to be an increase in numbers of intense earthquakes next year," he said. The year 2018 is set to witness a burst in seismic activity as scientists warn there could be a rise in the number of high-magnitude earthquakes across the world due to variations in the speed of earth's rotation. The devastating quakes are likely to result in loss of life and property in heavily populated tropical regions. However, experts from New Zealand have countered the views of the two American scientists, with one of them even saying, "It end to think of them in the context of [Moon Man] Ken Ring", reports the New Zealand Herald.

Dr Virginia Toy, a professor of Geology at the University of Otago said it is not a new thing that correlations are being made between natural events and other phenomena. "Some of these yield statistically defendable correlations; others don't," she said.

Two scientists from Japan's Tohoku University and two scientists from the University of California, found previously un recognized patterns that occurs just before large earthquakes of greater magnitude. Large earthquakes seem to be prefaced by silent and subtle deformation called "slow-slip events," according to the study. These occur almost periodically in the mega thrust zone in Japan, but are still unpredictable on large scale. They take place every 1 to 6 years and have often correlated with large earthquakes during a magnitude-9.0 quake that rattled northeastern Japan in 2011, Uchida and her colleagues reviewed data that showed subtle slips began to accelerate days before the massive quake, which spawned a deadly tsunami. Uchida and her colleagues analyzed seismic data dating back to 1984 fort woof Japan's largest islands, Phys.org also reports. From this data they were able to identify 1,500 examples where there seemed to be a pattern of repetition, which allowed them to gauge the speed of the tectonic plates underground.

From these statistics, they matched slippages with non-repeating measurable quakes that had a magnitude of 5 or higher. Their results indicated that there appears to be a speedup of slippage just before major earthquakes. GPS data was also used to measure tectonic shifting and reportedly matched the rates they previously calculated. "The results suggest the possibility of an earthquake is larger when slow slips are occurring," said Uchida. "By taking account of such relationships, the probability forecast of earthquakes can be improved."

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Error Analysis

Error in latitudes: Every latitude when varied by 2 degree may produce an uncertainty of the place towards north. The length and inclination of the fault zones near the epicentres will bring this uncertainty. As earths location is a macroscopic point and the precursor is also an macroscopic system the prediction system has an imbibed uncertainty. The prediction uncertainty depends upon the fault zones. Hence an uncertainty of 2 degree may shift even the nearest epicentre.

Error in longitudes: Each longitude when varied by 2 degree may produce an uncertainity of the place towards East. The length and inclination of the fault zones near the epicentres will bring this uncertainity. As earths location is a macroscopic point and the precursor is also an macroscopic system the prediction system has an imbibed uncertainity. The prediction uncertainity depends upon the fault zones. Hence an uncertainity of 2 degree may shift even the nearest epicentre.

Error in time of Prediction: For 4 to 5 magnitude earthquakes the time of prediction is +or minus 7 days requiring a watch time for normal anamoly. For greater magnitudes the anamoly persists for an extended period and the 4-5 shock may not occur and may accumulate beneth an energy that may appear delayed and doubled.

Uncertainty in Magnitude: As thousands of earthquakes happen at depths of lesser magnitudes every day everywhere, the magnitude of earthquakes predicted varies normally by 1 M.

Looking at the data the rainfall event prediction event always predicts the occurance 100% and uncertainties in position by 20% and time by 20 percent and magnitude by 10.

Inferences

As of now, this is the one and only testable earthquake prediction hypothesis, according to Dr. Jeremy Zechar, CSEP, who arranged to test this hypothesis. Tectonic plate motion causes both atmospheric and seismic anomalies at every epicentre zone. This is the reason why atmospheric weather anomalies are in relation with seismic anomalies. Cyclones are moving thousands of kilometers away from its origin and causes heavy damage. So, long distance of epicentre zone from precursor area not a surprise one, but it is true. Both the atmospheric and seismic analysis cause at same

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places in same regions namely Japan, Philippines, New Zealand, Iran, Indonesia and etc. Atmospheric anomalies in one region (US Southern Gulf States) and earthquake at different region (Mexico and Central American regions) is also a possibility.

Some important peculiarities observed:

- Earthquakes are short term in nature
- Interaction of centrifugal force with tectonic plate motions revealed with strong observational evidence.
- Position of the earth with respect to the sun determines the active motion of tectonic plates.
- More than 250 precursor areas and equal number of epicentre zones identified.
- Three stages of tectonic plate motions studied and observed.
- Both atmospheric and seismic anomalies caused by tectonic plate motion.

Conclusion:

In this study we assume that Geo Thermal energy that causes earthquake from the precursor processes themselves drives the climate. Though connection between weather and earthquakes were based on the global warming, associated weather disturbances and earthquakes the assumptions and related predictions earlier could not reveal the secret behind "All weather anomaly is associated with an earthquake event and all earthquake occurrence do not have weather anomaly" can be modified as "All weather anomaly is associated with an earthquake event and all earthquake occurrence do not have a so far known weather anomaly". However, this study can solve what is observed with a simple strategy that **The Geo thermal energy triggers weather**" and weather changes arrive first followed by earthquake at the epicentre and vicinity. The lag behind weather anomaly and P wave arrival may be predicted at the zones of influences map prepared by the principal author Prakash. The Prakash point in the Zones will indicate the criticality of the epi centre well in advance and may be integrated with the warning system. The very basic feature required to predict an individual earthquake is event like rainfall one of the weather changes. This concept shows the relation between rainfall and snowfall (any form of weather changes) and earthquakes (seismic activity). The worst natural disastrous atmospheric events and

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seismic events are intrinsically, permanently and inseparably coexisting in nature. Though they are subtle in one within another, not easily realizable and visible through normal eyes. Rainfall events are predominant in temperate zone and snowfall events are predominant in Frigid Zone classified as 250 zones. Like lightening followed by thunder, weather activities are always followed by corresponding seismic events at least in regions that are seismically sensitive. Hurricane, snowfall and rainfall events come first then followed by seismic events in the nearby corresponding places. The island rich ocean basins classified in to earthquake prone zones and rain fall monitoring data may be inspected periodically for an anomaly. When present then the nearest epi centre is already ready for receiving the P waves. The strategy if explored in details would certainly predict exactly the earthquake minimum one day to 2 weeks in advance. Indexing rainfall anaomoly to the nearest zone of influence will.

However, a deeper insight is arrived in understanding that would help management of occurring disasters in a better way. This works in the areas that are in the zones marked as earthquake prone by Prakash.

In this remarkable observational study that started in 1985, more than2 50precursor area and equal number of epicentre zones have been identified. This method has the 100% capacity to predict any size of the earthquakes, but here recorded M4-6+against rainfall 50mm and above. As long as rainfall continues so long as earthquakes will also likely to continue within the next 15 days. In each epicentre zone, the relation between centrifugal force and tectonic plate motion; the relation between tectonic plate motion and liberation of massive amount of plate frictional heat; the relation between plate frictional heat and atmospheric perturbation and relation between plate motion and atmospheric anomalies and seismic anomalies, all are confirmed with this observational study. Every year same epicentre zones affected but with different atmospheric and seismic anomalies. Both the rainfall events and the corresponding seismic events are occurring simultaneously in the same season at different epicentre zones. Seasonal effect of one region not affects the other region. Both the precursor area and the epicentre zones are either within 10°latitude and longitude or 10° x 20° rectangular area. The long distance between precursor locations to epicentre location (1000 to 2000km) confirmed with strong observational evidence.

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Only precursor location (mostly rainfall location) and seismic events are recorded meticulously and studied, tested rigorously, summarized and tabulated. The very simple conclusion is here is the rain and here will be the impending earthquakes of M4-6 in 15 days. Results are observed, tested and tabulated.

The resulting magnitude of the earthquakes are depending the severity of the atmospheric perturbation and also site geological condition. This is the reason, why sometimes epicentre zones simply exhibit low magnitude earthquakes. The atmospheric- seismic coupling activity is in the category of deterministic short-term earthquake prediction. As far real hundred percent prediction collaboration from leading laboratories and projects to support are solicited. An earthquake prediction must define all three elements -- the date and time, the location, and the magnitude. In this study the simple strategy that involves a flow chart that can aid us to predict the earthquake location and magnitude and time. More studies will bring a fool proof strategy with the climate modeling and statistics.

References

The Collaborator for the Study of Earthquake Predictability (CSEP) supports an international effort to conduct and rigorously evaluate earthquake forecasting experiments. This unique facility accelerates progress in prediction research by functioning as a new type of environment for earthquake prediction experiments: a virtual, distributed laboratory (collaboratory) with a cyber-infrastructure adequate to support a global program of research on earthquake predictability. CSEP testing centers are now operational in California, New Zealand, Japan, China, and Europe with 442 models under current evaluation. The California testing center, operated by SCEC, is testing30-minute,1-day,3-month,1-year,and 5-year forecasts for California, the Western Pacific, and global regions. This earthquake system science approach seeks to provide answers to the questions (1) How should scientific forecasting experiments be conducted and evaluated? and (2) What is the intrinsic predictability of the earthquake rupture process?

Few Interesting Facts and comparative study

From Los Angeles the pets indicate anomaly in behavior In south California rainfall anomaly also simultaneously observed.

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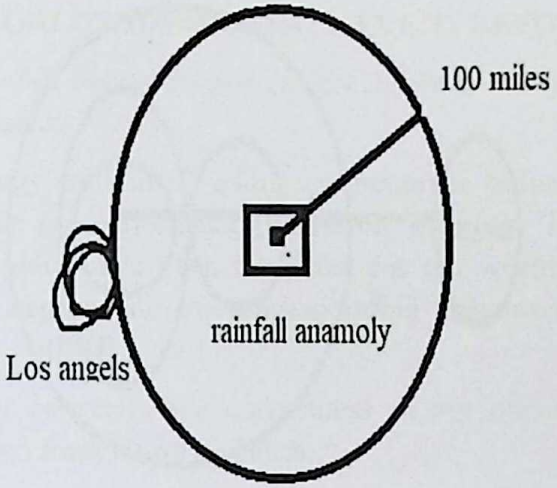

I discussed with them and obtained ground water measurement data during the 1994 Gujarat earthquake. I endeavored to unite a team during that time. The unreliability of the data and the insights I got needed extensive travel and I left it unattended half way. This time I get rejuvenated and I assured Prakash that his endeavors match the famous "Jim Berkland". Of all the natural disasters, earthquakes are the most powerful frightening and unexpected. Reducing the fear by increasing earthquake predictability is essential.

In 2005 July within 140 miles of Los Angels during the rare perigean tide window of July 19-26, a 3.5 plus earthquake was predicted by Jim Berkland. Later this period recorded rare spring tide and new record rain fall this past season in South California.-P186,"SYZYSY"

They observed an earthquake 4.2 was 107 miles from Los Angeles (L.A) Distance from 121 miles of South California climate anomaly.

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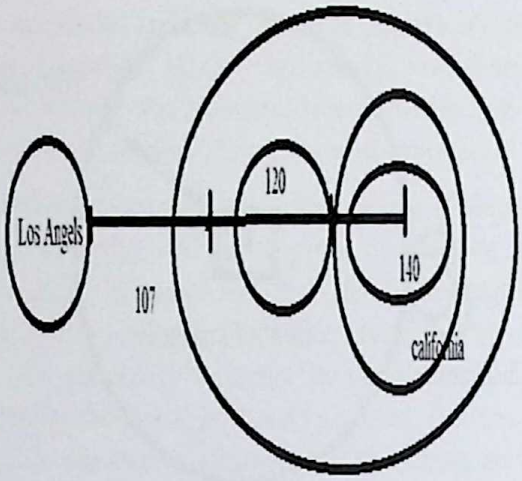

Maker (nick name calico) from her left ear predicts. Recording your dreams and correct the occurrence is also possible only emphericallly.

GPS stations use to navigate has a precursor parameters. However, GPS in seismology few can accuracy, (expensive), size of a coin. The movement of the land undersea may be measured using few techniques. During a 9R earthquake in 2011 in Japan, 5 measury station defect such move ends. 15 meter up to 24 meters of irrigated moment of the bottom of the whole sea and 3m of vertical movement. 100s of km of planets crust. Underwater robots are needed to install the stations at the bottom of the sea. They are also having a triangular array of acoustic sensors that communicates using each other.

"Know yourself and toy our own self, be true". He used to call the earthquakes above 4 as Rain Quakes

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TABULATION OF WORLDWIDE RAINFALL EVENT BEFORE EARTHQUAKES

Here is the rainfall above 50 mm (at precursor area)...and the corresponding epicentre zone (earthquakes M>4)

The methodology of rainfall event as precursor before earthquakes, works consistently worldwide for earthquake prediction warning. To support my study, sufficient observation data have been tabulated for the worldwide locations of the observed **precursory region** and the corresponding **epicentral zone (observation table below) at nearby places**

One can easily be verify the correctness of my observed data. Geological coordinates are arranged from North to South.

Interval between precursor and the earthquake striking: Usually minimum 2 weeks and exceptionally maximum 8 weeks time duration.

Table:1.10: QUAKESS.AMERICA (10-20S)

Brazil (1000S6748W 56mm)	Central Peru: 8.528°S,74.826°W Southern Peru: 16.351°S,70.329°W Tarapaca, Chile: 20.370°S,68.968°W
(Feb.)Bolivia (11-14S64-66 & 68W) Peru (12.65S69.20W57mm) Brazil (12.70S60.10W101mm)	M6.0 Nearcoast of Central Peru ; 14.21 S;75.76W.
Peru (1333S7159W 142mm)	Near coast of central Peru: 14-15°S, 75-76°W
Bolivia (14S66-67W)	Tarapaca, Chile: 17&19°S,69.434°W
	Southern Peru: 15.523°S,70.587°W

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Peru (1239S6912W99.1mm) Bolivia (13-14S64-65 & 67W) Brazil (2249S4315W63.1mm)	Peru-Bolivia border: 17.480°S,69.660°W Southern Peru: 15.542°S,70.700°W
Peru (13-15S54-70W) Bolivia (13-14S64 & 66W78.3 mm), Brazil 1550S54 23W52 mm)	Near coast of Central Peru: 14.306°S, 75.573°W Southern Peru: 15.869°S,70.382°W
Brazil (12 & 15 S 46 & 52 W)	Central Peru: 14.921°S,71.670°W 13.883°S,75.793°W Near coast of Central Peru: 15.210°S, 75.543°W Southern Peru: 16.322°S,71.772°W Cochabamba, Bolivia: 17.229°S, 66.074°W
Jan /Brazil (13-15 & 18-21S 40-41,45-46,50,52 & 56 W) (64-159 mm at 8 stans) Bolivia (11,13-19S59,62-65 & 68W) Flooding rainfall in Brazil: Jan1-4, 2012Weeks of abnormally heavy rainfall in eastern Brazil Minas Gerais (19.46 S 43.49W). Peru (15-1619S70-7133W365.0 mm), Paraguay (2446S5850W55.0mm)	(Jan) M6.4 Near coast of Central Peru: 14.179°S,75.644°W Near coast of Southern Peru: 16.221°S, 73.615°W Antofagasta, Chile: 20.902°S, 68.916°W
Bolivia (11-12,14-15S 63-64,66-67 &69W) Brazil	Chuquisaca, Bolivia: 19.550°S,64.018°W

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(12&15S41&47W 54mm)	
Bolivia (1452S6652W 58.9mm) Brazil 1539S5606W 200mm)	Southern Peru: 15-16°S,71.769°W Potosi, Bolivia: 21.486°S,66.713°W Near Coast of Antofagasta, Chile: 21.267°S,70.509°W
Bolivia (14&16S 62,65-67,71W) (59-141mmat 4stans) Peru (1619S7133W802.1mm) Brazil (1000S6748W53mm), (1304S6449W66.1mm)	Southern Peru,: 15.719°S, 70.760°W Near coast of southern Peru: 15.596°S, 74.048°W
Bolivia & Brazil (11-12&16S48,62&68W)	Tarapaca, Chile: 20.219°S,69.185°W
Bolivia (13-14&17S63-65W) (54-107mmat 7stans)	Tarapaca, Chile: 19.692°S,69.127°W
Bolivia (13-14S 65-67W) (18&21S57&63W) Brazil (12&14-15S42,48,54&60W) (14&19S 42&57W)	Southern Peru: 15.948°S,71.968°W Potosi, Bolivia: 20.371°S,67.922°W
Peru (1333S7159W 166mm) Bolivia (1346S65 26W57.8 mm) Brazil (14-15,17-18& 20S 44- 46,50W) (17,19-20 & 23S48-51W)	Near the coast of Central Peru: 13.283°S, 76.494°W Tarapaca, Chile: 20.468°S,69.012°W 18.890°S,68.993°W Antofagasta, Chile: 21.619°S,68-69°W Offshore Antofagasta, Chile:

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(12,15 &17S 39,44,48,54&60W) (2115S6327W62.4mm), Paraguay (2242S6130W 51.8mm) (2446S5850W 63.4mm)	21.808°S,70.265°W
Feb.11, 2012 Bolivia (13-14S64-66W94.8mm), Brazil (10,12,14&16-17,20&23S 41,46-50&56-57&60-68W)	Near coast of central Peru: 12.411°S, 76.938°W Southern Peru: 15.652°S,72.783°W Tarapaca, Chile: 18.224°S,69.603°W Potosi, Bolivia: 21.426°S,66.612°W
Brazil and Bolivia (02,05,07,11,14S56,61,64,66- 68E) (02.53S66.16W) (05.81S61.30W) (07.25S64.83W) Bolivia (11.03S68.78W) (14.46S67.56W)	Chuquisaca, Bolivia; 19.29 S;63.93W.
May Bolivia (14,17-18S59&63-64W64.2 mm), Brazil (10,15&21S 41,48&56W)(54-200mmat4 stans). Argentina (2239S6349W471.5mm).	M6.2(May)Tarapaca, Chile: 17.816°S, 69.749°W 19.837°S, 69.026°W M6.0(May)Southern Peru: 15.919°S, 72.516°W 16.806°S, 70.886°W Near coast of Central Peru: 12-13°S, 76.146°W Central Peru: 10.286°S, 74.570°W Peru-Bolivia Border: 16-17°S, 69.832°W
Peru,Bolivia & Brazil (12-16&19S 48,52,54,57,60,62,64&69W) Paraguay	Tarapaca, Chile: 19.638°S,69.093°W
(2516S5738W 52mm)	
Bolivia, Peru & Brazil (12,14,19-20S 48- 49,51,54,65-66 & 69W)	Near coast of Central Peru: 14-15.330°S, 75.392°W Southern Peru: 15.283°S, 73.251°W

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Bolivia (11,13-19S51,62,64-67E) Brazil (12-19S 46,52,56-58W 51 mm), Peru (12-13S69&71W50mm)	Near the coast of central Peru: 11-12°S, 76-77°W Central Peru: 11.420°S,76.783°W 12.878°S,70.974°W Tarapaca, Chile: 19.899°S,69.216°W
Bolivia (19.98S57.81W50mm)	M5.5 Lapaz,Bolivia;17.24S; 69.38 W (in 4 days)
Brazil (09-10,15,18-19&22S 41- 43,47,54,56-57 & 67 W) Bolivia (11,13-16,18&21S 59,62-65 &67-68W) Peru (13 & 15S 70 & 74W) (98- 174mm)	Southern Peru: 15.257°S,72.765°W Tarapaca, Chile: 17.948°S,69.470°W Potosi, Bolivia: 21.409°S,66.659°W
Bolivia (14-15S56,63,65-66W) Brazil (10,12-13,15-16,18-22S 41-43,45,47-50 & 52W) (50-114mmat 12 stans)	Southeast Central Pacific Ocean: 17.049°S,79.510°W Near coast of Tarapaca, Chile,: 20.313°S, 70.571°W
May /Bolivia (14S 66- 67W) (69-994mm at 2 stans) Eruption of Ubinas (16.355°S 70.903°W) was continuing during June-July.	Aug. 23, 2014 / M 7.0 Central Peru; 14.64 S ; 73.53 W .
Oct./Bolivia: (18-20S 57,59,63W) (65-95mmat 3 stans)	Mato Grosso DoSul, Brazil; 19.91 S;55.32W .

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Table:1.11: Quakes S. America (20-30S)

Argentina (2239S6349W362.0mm)	Antofagasta, Chile; 23-25S;67-69W.
Paraguay (2217S57 52W995.2 mm) Argentina (2727S58-59W93mm)	Jujuy, Argentina: 22.875°S,66.102°W Antofagasta, Chile: 24.268°S, 69.522°W Salta, Argentina: 24.287°S, 67.047°W
Mar.,2014 Argentina, Brazil & Paraguay (23-27S54-60W) (57-967mm at 9 stans)	Apr.01-03,2014/M 8.2 (7.6; 6.2;5.8;5.8;5.7;5.7;5.6) Offshore Tarapaca, Chile; 19- 20 S; 69-70W.
Argentina (22,24-25&28S 54,63&65W179.9mm) Paraguay (22,25,27&30S51,54-55W) Brazil (20-22, 24-25, 28 & 30S45, 49,51,54- 55 & 65W)	(Jan) M5.5 Tarapaca, Chile: 20.102°S, 69.195°W Jujuy, Argentina: 24.141°S, 65.307°W Atacama, Chile: 25.469°S, 68.824°W SanJuan, Argentina: 28.627°S, 69.279°W
Sep. /Paraguay, Argentina, Brazil (24-27S 53-58W) (50-92mm at 13 stans)	Sep./M6.2Jujuy, Argentina; 23.79 S;66.47W.
January	LaRioja, Argentina:
Paraguay (2527S54 51W562.0 mm) Argentina. (2727S58 46W50 mm) Uruguay (3313S5423W73mm)	28.504°S,67.365°W (Jan)M6.8(4.5;4.6) Atacama, Chile: 28.181°S,70.800°W. 26.160°S,69.043°W Coquimbo, Chile: 31.128°S,71.375°W
Paraguay (2013S5810W74.9mm) Brazil (20,23-24S47&50-51W60mm),	Potosi, Bolivia: 21.087°S,67.425°W

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Argentina (2722S5558W414mm)	
Argentina (2442S60 35W88 mm), (2727S58 46W50 mm) Paraguay 24-25S57-58W50.0mm), Brazil (2815S52 24W59 mm)	Salta, Argentina: 24.994°S,68.300°W Antofagasta, Chile: 21.759°S,68.337°W (Feb)M6.1-SantiagoDel Estero, Argentina: 27.993°S,63.195°W
Paraguay (24-26S49,54-56,61W) Brazil (2002S4856W50mm) (2920S4944W52mm) Argentina	Antofagasta, Chile: 23.109°S,67.263°W Catamarca, Argentina: 27.747°S, 66.277°W Offshore Atacama, Chile: 27.472°S,71.257°W
(2544S5428W63mm), (2953S6157W90mm)	Salta, Argentina : 24.214°S,67.016°W Near coast of Antofagasta, Chile: 22.882°S,70.369°W Jujuy, Argentina: 23.880°S,66.673°W
Paraguay, Argentina, Brazil & Uruguay: (26-29 & 31N52-53, 55 & 57- 59W) (54-660mm)	Offshore Coquimbo, Chile; 29-30 S; 71.96 W.
Brazil (2945S5705W 112mm)	Coquimbo, Chile,: 30.446°S,71.127°W
Paraguay (25 & 27S54-56W51.9mm), Argentina (2722S5558W118mm) Brazil (2724S5112W60.9mm) (2824S5501W51mm)	SanJuan, Argentina: 31.250°S, 68.670°W
Brazil& Paraguay (23,25-28S 50-51,53,55-57W)	Salta, Argentina: 24.087°S,67.473°W Atacama, Chile:

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(52-85mmat9 stans)	27.892°S,69.463°W
Brazil (ME) (20-21S40-41W184mm), Paraguay, Argentina & Brazil (21-23,27-29S48,53,55,57, 59W) (50-105mmat11stans)	Antofagasta, Chile: 23.656°S,68.316°W Jujuy, Argentina: 23.860°S, 66.674°W
Paraguay (2325S57 18W70 mm) Argentina (2727S5846W50mm), (2722S5558W56.9 mm) Brazil (2824S55 01W84.9 mm)	Coquimbo, Chile: 30.102°S,71.213°W
Paraguay (22-25S54, 57 & 60W) Argentina (23,26 & 27S 55&58W) (50-96mm), Brazil (19,22,28-29S51,53&55W87mm) Uruguay (3222S5611W 93mm)	Antofagasta, Chile: 21&23°S,67-68°W Salta, Argentina: 24.128°S,66-67°W. LaRioja, Argentina: 29.052°S,68.870°W
Argentina (2651S65 06W164.0 mm)	Antofagasta, Chile: 23.161°S,67.127°W
Bolivia (1748S6311W 55mm) Brazil (2232S55 42W70 mm) Paraguay (22-25S55-57W) (70-103mm at 6 stans)	NNE of Calama, Chile: 21.009°S 68.545°W Antofagasta, Chile: 21.66 S; 69.88 NE of San Pedrode Atacama, Chile: 22.164°S67.320°W ENE of Diegode Almagro,
	Chile: 26.177°S69.223°W SW of Andalgala, Argentina 27.867°S 66.635°W

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Paraguay (25 & 27S54-56W) Brazil (2531S5435W87mm) Argentina (25,27 & 29S54-55 & 59W85 Mm	NNE of Taltal, Chile: 24.549°S 70.163°W Salta, Argentina: 24.30 S;67.36W ENE of Diegode Almagro, Chile: 26.197°S69.167°W
Argentina (2746S64 18W50.9 mm), (2953S6157W601.0mm)	Jujuy, Argentina: 22-23S; 66.54W Antofagasta, Chile 21.56 S;68.34W 23-24S;67-68W Coquimbo, Chile: 29.79 S;71.26W Valparaiso, Chile: 32.27 S;70.71W

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Table:1.12: Quakes S. America (30-40S)

Paraguay, Argentina, Brazil & Uruguay (26-29 &31N 52- 53,55&57-59W) (54-660mm at12stans)	Oct./M6.2(5.8;4.7;4.3;4.1) Offshore Maule, Chile:35-36S; 72-73 W. Oct./M6.6 Coquimbo, Chile; 30.33 S;71.66W.
Argentina	SanLuis, Argentina:
(32-33S62&64W) (51-109mm) Uruguay (32-33S57-58W) (59-66mm) Brazil 3000S51&57W50mm)	32.832°S,66.667°W Offshore Maule, Chile: 34.650°S, 72.677°W Offshore O'Higgins, Chile: 34.271°S, 72.226°W
Argentina (3316S6621W 593mm)	M5.6 Coquimbo, Chile: 31.634°S, 71.556°W SanJuan, Argentina: 31.682°S, 68.050°W Libertador O'Higgins, Chile: 34.535°S,71.886°W
Argentina (27&29S 55,57&63W) (58- 990.2mm) Brazil (29-32S51-54W) (64-161mm) Uruguay (30&34S55W) (60-75mm)	SanJuan, Argentina: 31.510°S, 67.919°W Offshore Valparaiso, Chile: 32.172°S, 72.138°W Offshore Coquimbo, Chile: 32.097°S, 72.290°W
Argentina (3435S6824W 231.6mm)	Offshore O'Higgins, Chile: 33.990°S, 72.124°W South east of Easter Island: 35.502°S,104.743°W
Argentina (31,33-34S68W)	Valparaiso, Chile; 32.98 S;70.28W.
April Argentina & Chile (33-34S 63,65&70W) (65- 445mm)	Coquimbo, Chile: 30.957°S,71.145°W April M6.5 (M5.1) Valparaiso, Chile; 32.692°S, 71.449°W Libertador O'Higgins, Chile: 34.385°S,

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	70.162°W West Chilerise: 36.217°S,97.123°W
Paraguay () (2439S56 26W56.4 mm) Brazil (27-28S51&55W) Uruguay (32-34S55-58W) (3427S5750W 85mm) Argentina (31-34 & 36S 55, 58.60- 62 & 66W) 55-461mm)	Mendoza, Argentina: 32.866°S, 69.930°W Offshore Valparaiso, Chile: 33.589°S, 72.028°W Mendoza, Argentina: 33.435°S, 67.479°W Libertador O'Higgins, Chile: 34.769°S, 71.688°W Bio-Bio, Chile: 37.523°S, 72.914°W
Argentina (34&3621S57-58W53mm)	South east of Easter Island: 36.144°S,98.558°W
Argentina & Uruguay (31&34S57-58&60W)	Offshore Libertador O'Higgins, Chile: 33.938°S,72.182°W November 21, 2012 Quake of M5.9 (5.2; 5.1; 4.5) Offshore Libertador O'Higgins, Chile: 34.016°S,72.017°W
Chile, Brazil &Argentina (31&33-34S54,60&78W)	Libertador O'Higgins, Chile: 34.563°S,71.919°W
Argentina (33-35S60,63-64W)	Offshore Valparaiso, Chile: 32.720S 71.690W Mendoza, Argentina: 32.829°S,68.963°W Easter Island: 30.123°S,111.177°W Coquimbo, Chile: 31.138°S,71.335°W
Argentina (3542S63 45W61 mm)	Libertador O'Higgins, Chile: 34.703°S, 71.559°W Offshore Bio-Bio, Chile: 38.177°S, 73.843°W South east of Easter Island: 41.148°S, 91.090°W

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Brazil, Argentina, Uruguay & Chile (28-36S 53-58,60,63-64 &71W)	Offshore Coquimbo, Chile: 31.772°S, 71.959°W Offshore Valparaiso, Chile: 32.208°S, 71.931°W Valparaiso, Chile: 32.867°S,70.401°W Offshore Libertador O'Higgins, Chile: 34.077°S,72.268°W Offshore O'Higgins, Chile: 34.620°S, 72.285°W Libertador O'Higgins, Chile: 34.689°S, 71.906°W Offcoast of Maule, Chile: 35.306°S,73.933°W
Argentina (3634S64 16W61 mm)	South east of Easter Island: 36.203°S,100.250°W
Argentina & Uruguay (30-36S54-59&63W)	Araucania, Chile: 38.943°S,72.913°W
Brazil (3120S5406W72.9mm) Argentina (33-34&36S 57-58,60-61 &65W)	SanJuan, Argentina: 32.115°S,69.715°W Libertador O'Higgins, Chile: 34.762°S, 71.865°W Maule, Chile: 34.981°S,71.048°W Offcoast of Maule, Chile: 35.190°S, 73.957°W Offcoast of Bio-Bio, Chile: 37.964°S, 75.175°W Bio-Bio, Chile: 37.286°S,73.205°W
Argentina, Uruguay, Paraguay & Brazil	Coquimbo, Chile: 30.353°S,71.224°W
(27-36S52-64W) .	SanJuan, Argentina: 31.553°S, 69.356°W Maule, Chile: 34.930°S,71.563°W Southern East Pacific Rise: 34.650°S, 107.416°W March 25, 2012 Quake of **M7.1** Maule, Chile:

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	35.183°S, 71.792°W
Argentina (34-36S58-59&63W)	Offshore Valparaiso, Chile: 33.521°S, 71.937°W Region Metropolitana, Chile: 33.083°S, 70.865°W Maule, Chile: 35.253°S,72.141°W Offshore Bio-Bio, Chile: 36-37°S,73.566°W
Argentina & Uruguay (31-32,34&36S56&58-59W)	Coquimbo, Chile: 31.903°S,71.106°W Offshore Valparaiso, Chile: 33.844°S, 72.178°W Maule, Chile: 35.210°S,72.020°W. Offshore Bio-Bio, Chile: 36.958°S, 73.799°W Offcoast of Araucania, Chile: 38.284°S,74.988°W
Argentina & Uruguay (26&31,33-34&36S 54,56- 58,60 &63W)	Offshore Atacama, Chile; 27&29 S; 71.59 W. SanJuan, Argentina; 31.64 S;68.80W. Offshore Valparaiso, Chile: 32-33.32 S; 71-72.06 W. Offshore O'Higgins, Chile;
	33.90 S;72.35W. Maule, Chile; 35.26 S;71.07W.
Chile (3337S7849W 271mm) Argentina & Uruguay (26-37S 56-60W)	Valparaiso, Chile: 32.435°S,71.225°W Maule, Chile: 35.776°S,71.253°W Bio-Bio, Chile: 37.211°S,73.522°W
Argentina (3714S59 15W75 mm)	Mendoza, Argentina: 32.014°S,69.206°W
Argentina Paraguay, Beazil & Uruguay (26-37S52&54-60&63W) Chile (3458S71 13W63.2 mm)	San Juan, Argentina: 31.244°S,68.461°W. Offshore Libertador O'Higgins, Chile: 33.967°S,72.090°W Libertador O'Higgins, Chile: 34.836°S,

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	71.601°W Maule, Chile: 35.858°S,72.267°W Offshore Maule, Chile: 35.765°S, 73.274°W Bio-Bio, Chile: 37.298°S,73.428°W
Argentina (36-37S57&61W102.4/229 mm),	Offshore Valparaiso, Chile: 32.734°S, 71.785°W Neuquen, Argentina: 36.912°S,70.605°W
Argentina, Uruguay& Chile (31-37S56,58-61,69&71W)	Coquimbo, Chile: 31.621°S,71.416°W Mendoza, Argentina: 32.995°S,68.529°W M5.8 Maule, Chile: 35.993°S,70.772°W
	Neuquen, Argentina: 36.945°S, 70.621°W Offshore Bio-Bio, Chile: 37.075°S, 73.567°W Offcoast of Araucania, Chile: 38.241°S, 75.008°W West Chile Rise: 41.373°S,87.963°W
Chile (3323S7047W 407.5mm) Argentina (37S57 &59W) (3820S6015W 50mm)	SanJuan, Argentina: 31.826°S, 68-69°W Mendoza, Argentina: 32.678°S,69.851°W Region Metropolitana, Chile: 33.859°S, 70.077°W Libertador O'Higgins, Chile: 34.242°S, 70.194°W Bio-Bio, Chile: 37.927°S,73.448°W
Argentina (35&38S62-63,68W) (3844S6210W71.2mm)	Bio-Bio, Chile: 37.617°S,73.440°W
Chile (3635S72 02W53.9 mm) Argentina (3434S5825W 61mm) (3820S6015W59mm)	West Chile rise: 37.160°S,94.968°W Offshore Bio-Bio, Chile: 38.151°S, 73.730°W
Argentina	Easter Island: 31.380°S,111.416°W

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(32,36&38S59-60&62W)	Region Metropolitana, Chile: 33.053°S, 70.851°W January 23, 2012 Quake of M 6.2(M5;4.9) Offshore Bio-Bio, Chile: 36.415°S,73.015°W
	Southern East Pacific rise: 36.582°S, 110.433°W Offshore Bio-Bio, Chile: 36.662°S,73.323°W
Wildfires rage in Chilean national park Dec.-Jan. SANTIAGO: Forest fires in southern Chile, destroying nearly40,000 hectares. In Bio Bio region, 22,500 hectares have been destroyed, Jan Argentina Heat stresses: Temperaturessoaredto100 degrees F and more in the South western Pampas, Registered 107 degrees.	Offshore Coquimbo, Chile: 31.614°S, 71.639°W Valparaiso, Chile: 32.548°S,71.309°W Offcoast of Bio-Bio, Chile: 37.996°S, 75.186°W OffCoast of Aisen, Chile: 45.819°S, 76.461°W
Chile (3938S7305W61.6&53 mm)	Southeast of EasterIsland: 35.380°S, 103.594°W
Argentina, Uruguay & Chile (34-37S 56,59,63&72W) Argentina (4047S6506W65mm)	Libertador O'Higgins, Chile: 34.765°S, 71.809°W Offshore Maule, Chile: 35.682°S,72.837°W
Argentina & Uruguay (29,31-34,36-38,40-41&43S 55,57-58,60-65&68W)(51-86mmat 17 stans)	SanJuan, Argentina; 29.68 S;69.67W. Offshore Valparaiso, Chile; 33.36 S;72.15W.

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Table:1.13: QUAKESS. AMERICA(40-60S)

Argentina (4051S6301W 75mm)	Off coast of Aisen, Chile: 44.502°S, 78.622°W
Argentina (4109S71 10W695 mm)	Pacific-Antarcticridge: 55.604°S, 127.536°W
Argentina (4109S71 10W692 mm)	South Sandwich Islands: 56.304°S, 25.733°W
Argentina (4256S71 09W273.5 mm)	West Chile rise: 44.868°S,81.458°W. GLF. Corcovado, Los Lagos, Chile: 42.618°S,73.418°W
Chile (4312S71 49W252.7 mm)	Off the coast of Aisen, Chile: 44.495°S, 78.992°W. South east of Easter Island: 40.896°S,92.042°W
Chile 4334S7450W50.9mm	Off the coast of Aisen, Chile: 45.451°S, 75.696°W
Chile (4312S7149W 50.5mm) *(4524S7240W 55.4mm)	Off coast of Aisen, Chile: 45.680°S, 76-77°W
Chile (4555S7142W989mm)	Southern East Pacific rise: 49.674°S, 116.224°W
Chile *(4524S7240W 60mm)	Quake of M 6.2 Drake passage: 57.588°S, 65.414°W
May Chile (4536S71-72W66.5mm)	West Chile Rise: 40.486°S91.379°W 41.395°S87.729°W M6.8-OffthecoastofAisen, Chile: 44.927°S78-80°W W of Puer to Chacabuco, Chile: 45.594°S 76.587°W
Argentina (5137S6917W 65mm)	South Sandwich Islands: 56.339°S, 25.749°W 59-60°S,26.637°W

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Argentina (4115S68 44W98.9 mm),	Scotia Sea: 60.930°S,36.967°W
(5137S69 17W95.7 mm)	Balleny Islands: 61.596°S,154.288°E
Chile: (5224S7506W67mm)	Southern Pacific Ocean: 48.335°S, 86.863°W. South Sandwich Islands 55-56°S, 24 &27°W 59.568°S,26.241°W South Atlantic Ocean (53.114°S,46.971°W Scotia Sea: 60.792°S,41.769°W
Argentina (5448S68 19W372.5 mm)	South Sandwich Islands, 55-56°S, 27-28°W ENE of Bristol Island, Antarctica): 58.834°S, 25.221°W
Argentina (6015S72 03W150 mm)	South Sandwich Islands: 60.496°S, 25.686°W
Argentina (60.75S44.71W82mm)	M5.9ScotiaSea; 60.48 S;45.33W.
Uruguay (6211S58 51W275.2 mm)	Scotia Sea: 60.621°S,51.332°W
Stations Operated by The Republic of korea (6213S58 45W963 mm).	South Shetland Islands: 61.416°S, 58.175°W
Nov./Chile (6213S5858W) (322-550mm at 3 stans)	Nov./M6.1/6.9ScotiaSea; 60.28 S;47.50W. Nov./M7.0(5.6;5.5;5.4;5.2) Falkland Islands (South Atlantic); 54.44S; 55.64 W.
Chile: (6230S5941W931mm)	ScotiaSea: 60.406°S,31.915°W South Sandwich Islands: 58.529°S, 26.345°W); NNE of Visokoi Island,); 56.200°S,26.918°W;55.624°S,
	27.470°W
China(Honshu) (35-36N117&119E104mm)	Sea of Japan; 37.52 N;134.02 E.

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Table 2.7: Izu Islands

Japan	Izu Islands, Japan
(3412N129 18E64 mm), (3242N128 50E63mm) SKorea (34-35N126-128E)	29.414°N,141-142°E 32.144 N138.664E
SKorea & Japan (32-35N125-130,132-135E)	Sep./M6.4 (10th day) 30.01N; 138.86 E
(25,28&31-35N 129-133E) (57-120mmat 6stans)	30-31N140-141E
SKorea (33-34N126-129E)	32.372°N,139.076°E
(3306N13947E55mm)	29.592°N,138.491°E; 31.651°N,140.567°E
(28 &31N129 &131E)	32.448°N,141.554°E
(24,26,28 & 31N 124- 125,127,129-130E)	31.424°N,140.165°E
(24-26&31N121,125,127&131E)	(30-33N138&140-141E)
(2550N13114E59mm)	29.915°N,138.926°E

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Table 2.8: Bonin Islands

Japan	Bonin Islands
Sep./Tropical Storm Fengshen	M5.4 Bonin Islands, Japan;
27.7N129.7E; Wind:65mph.	28.00N; 139.62 E.
(2705N14211E108mm)	26.924°N,143.795°E 27-28N;138-139E.
(2612N12741E79.0mm) (2447N125 17E52 mm)	27.22N; 141.60E.
China (2538N122 04E59 mm) Japan (2447N12517E62.5mm) Taiwan (2245N12109E113mm)	Bonin Islands, Japan; 26-27 N ; 143-144E. Izu Islands, Japan; 29.35N; 138.92 E.

Table 2.9: Volcanic Islands

Ryukyu Islands, Taiwan, Japan & China	Volcano Islands, Japan
(26,28,31, & 35N127 & 129-133E)	East of the Volcano Islands: 22.992°N,146.050°E
Ryukyu (2823N12930E57mm) (2612N12741E51mm) Aug.20-27,2012 Typhoon Bolaven (Nr Ryukyu) Wind:110MPH— Location:28.6N126.8E)	23.045°N,145.985°E
(2612N12741E103mm), (2447N12517E99.5mm)	23.200°N,143.225°E
(24N124-125E)	23.149°N,143.294°E
(2420N12410E250mm)	22.042°N,144.321°E
(22,24-25N 121-122,125 17E) (51-113mmat3stans)	23.52N; 143.19E.

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China(Taiwan) (23,25-28N 111-112,115-119E) (50-85mmat 9stans)	Volcano Islands, Japan; 22-23N;143-144.30E.

Table 2.9A: North Pacific Ocean

Japan (24.30N153.96E52mm)	North Pacific Ocean; 29.21N; 151.64 E.

Table 2.10: (Shikoku and Kyushu)

Japan(S) (3334N13333E61mm) (33-34N 129-130E)				August /M 5.0 Kyushu, Japan, 32.058°N,130.069°E.	
S.Korea (33N126E) Japan (32-34N128-129,132- 133&138-139E)				Off the East coast of Honshu, Japan: 33.250°N,141.937°E	
Sep Japan(S) (33-34N131&133-134E)				Oct/M5.3 Kyushu, 31.221°N,130.192°E	Japan
Japan (34N134-135E)				Kyushu, Japan: 30.113°N,130.983°E	
Japan(S) (31&33N131&133E)				Shikoku, Japan, 33.754°N,132.183°E.	
Japan(S) (31&33N131-132E) Japan(S) (26,28,31&33N 127,129,131&133E)				Kyushu, Japan: 31.943°N,131.661°E. Shikoku, 33.465°N,133.450°E	 Japan
Japan	(33-34N	126	&129E)	Shikoku, Japan;	
(52-145mmat 3stans)				32.13N; 134.37 E.	
Japan (3244N12952E62.5mm)				Off the East coast of Honshu, Japan: 33.285°N,141.758°E.	
Japan(S): (3133N13033E68.0 mm) Sakurajima Volcano Erupts (Kyushu)				Kyushu, Japan: 30-31°N,130-131°E	
China (2918N11712E101.2mm).				Kyushu, Japan: 31.556°N,131.560°E	
Japan (2823N12930E52.0mm)				Shikoku, Japan: 33.554°N,132.116°E.	

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Table 2.11: Ryukyu islands

Taiwan(N):		Ryukyu Islands, Japan,
(2746N118 02E60 mm)		25-29°N,125,128-131°E.
Japan(S):(2420N124	10E	
69.0 mm)		
China (Nr Ryukyu)		South east of Ryukyu Islands,:
(30-35N106-119E)		23.602°N,126.748°E
		Ryukyu Islands, Japan:
		24.163°N,126.191°E
		Southwestern Ryukyu Isl.,
		Japan:
		24.990°N,123.192°E
China (Ryukyu)		Ryukyu Islands, Japan:
(24-32N115-122E)		29.485°N,130.579°E
		28.493°N,128.411°E
		25.172°N,126.579°E

Conclusion

10 key points:

1. The orbital motion of the earth with respect to the sun with 23.5° degree tilt reason for movement of geological plates within the earth.
2. Due to movement of geological plates enormous amount of released frictional heat energy reason for all form of atmospheric weather changes.
3. Atmospheric weather changes, predominantly rainfall are always followed by earthquakes at corresponding nearby places up to 20° variation in geological coordinates in a repeatable manner and in recurrent pattern.
4. Atmospheric weather changes are more frequent at densely populated Islands regions like Indonesia, Japan, Philippines, South Pacific Islands regions than Islands free region.
5. Earthquakes may not happen after nearby place corresponding weather changes with the expected magnitude but no single earthquake happens without affecting nearby respective atmospheric weather.
6. The time intervals between weather changes followed by earthquakes are only

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within few days to few weeks (2-4) in most cases

7. Earthquakes are short term in nature and no long term, it is inherently predictable like other weather events.
8. The resulting magnitude frame of earthquakes after 50mm and above rainfall would be 4-6. Also depend on the severity of weather and site geological condition irrespective of depth.
9. Like cyclic variation of season every year, earthquakes are also having cyclic pattern to happen at same places every year only with the variation in magnitude.
10. Like other weather warnings, earthquakes also predictable and can could be warn, but it would be impossible to displace millions of people to safer places. So the present criteria of earthquake prediction do not serve any meaningful purposes.
11. Weather changes are undeniable uniform earthquake precursor to the corresponding nearby places. A strong evidence of data collected for both the corresponding events clearly shows the strong inter relationship between location of rainfall and the corresponding location of earthquakes and could be useful reference for prediction of future earthquakes.

Sample of three significant Earthquakes after historic weather changes in the nearby places including March 11,2011, Japan tsunami:

1. **March 11, 2011, tsunami in Japan**
2. **Hurricane Harvey followed by Sep.08, 2017, M8.2 Earthquakes at Offshore Chiapas, Mexico: (continuous warning ignored)**
3. **Winter Storm Grayson: Bomb Cyclone followed by Jan.10,2018/M7.6 North of Honduras (continuous warning ignored)**

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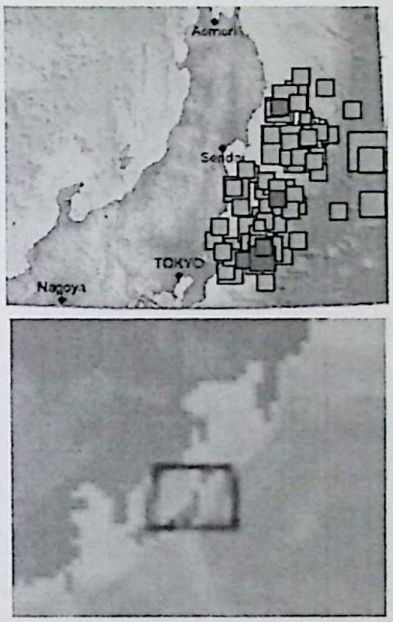
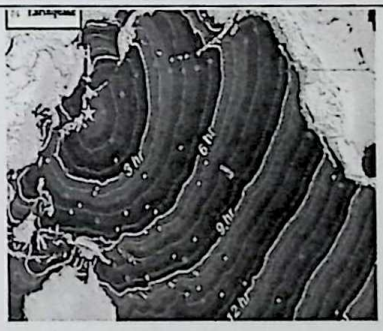
Heaviest snow fall in South Korea in 100 years followed by March 11,2011, tsunami in Japan

Feb.14, 2011 Heaviest snowfall in South Korea: The heaviest snow falling more than a century on South Korea's east coast. The worst weather has been in Gangwon province. Weather experts say there will be more snow falling the area in the coming hours.	Quake of M8.9 Near East coast of Honshu, Japan, Friday, March 11, 2011, (E of Sendai, Honshu, Japan), Location: 38.322°N, 142.369°E; Dep th:24.4km Dozens of aftershocks have since followed the Devastating earthquake. 
1960s. In Gangwon on the eastern coast, one city recorded 80cm (2.6 feet) of snow in a single day - the heaviest fall in 24 hours since records began back in 1911.	 A map showing the estimated time it will take for tsunami waves to travel across the Pacific Ocean. Earlier Friday, a 23-foot tsunami washed ashore across northern Japan along the Miyagi prefecture, causing

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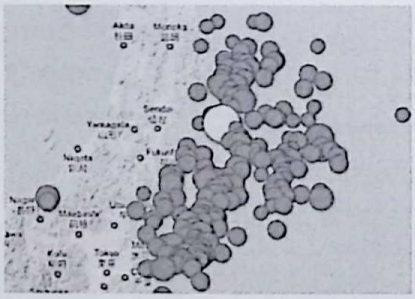
	devastating damage. Earlier, Japan's meteorological agency issued tsunami warnings for the Miyagi prefecture, warning that a tsunami as high as 20 feet. Prior to Friday, the previous strongest earthquake to strike Japan had a magnitude of 8.5 and occurred in June 1896. That earthquake and resultant tsunami claimed the lives of over 27,000 people, according to the USGS. Friday's earthquake is also the "fifth-largest instrumentally-recorded earthquake in history [which dates back to 1900]," stated Rich Briggs, a research geologist with the USGS. The 9.5-magnitude earthquake that struck Valdiva, Chile in 1960 ranks first.
	 March13, 2011 More than 300 aftershocks, all centered near the epicentre of Friday's quake east of Honshu, are occurring several times each hour. A large percentage  have been of The Shinmoedake volcano in Japan's Kyushu has erupted two days after the massive earthquake and tsunami that left more than 10,000 people dead, reports said on Sunday.

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	There was no confirmation on whether the eruption was related to Friday's earthquake. The eruption of Shinmoedake in January, which was the biggest volcanic Widespread destruction and panic. The USGS said that the earthquake was caused by a rupture on Earth's crust, which the agency said covers an area of 250 miles long and 100 miles wide, while tectonic plates slid by about 18 meters. Geographic coordinates(latitude/longitude): 38.322, 142.369 Japan, Tohoku Province (population: 9984608). Seismicregion: Near The East Coast Of Honshu.

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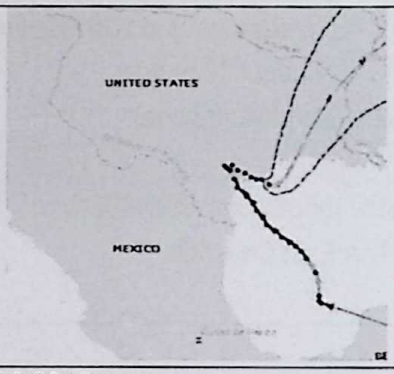
2. Hurricane Harvey followed by Sep.08,2017, M8.2 Earthquakes at Offshore Chiapas, Mexico: (continuous warning ignored)

<table>
<tr>
<td>Aug.17-Aug26,2017
Hurricane Harvey
Location:13.1°N 55.1°Wto
28.3N97.1W; wind: 130mph</td>
<td>Sep.08,2017/M8.2
(M5.7 at 15.87 N; 94.09 W) Offshore Chiapas, Mexico;15.08N; 93.74W.(NW)
M8.2, making it the largest in Mexico in 100 years.</td>
</tr>
<tr>
<td> 
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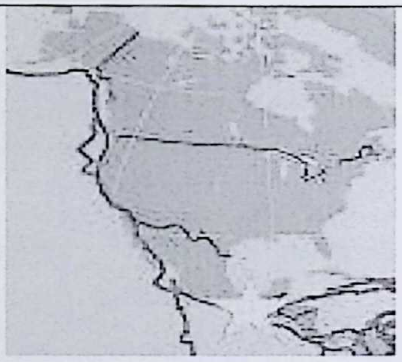
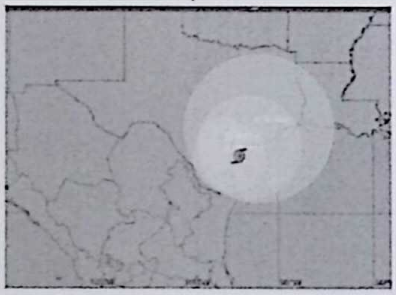
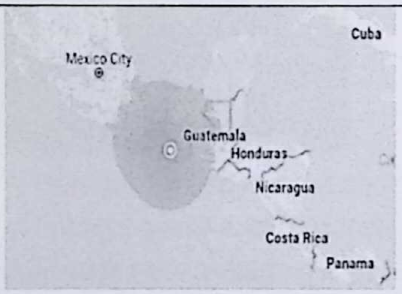
<td>  </td>
</tr>
<tr>
<td>Aug26,2017
US Gulf Coast South
(28.85N96.91W36m)
 
</td>
<td> 

Aug.28, 2017/M4.1 Offcoast Of Chiapas, Mexico;14.10N;

Aug.28, 2017/M4.2 Puebla,</td>
</tr>
</table>

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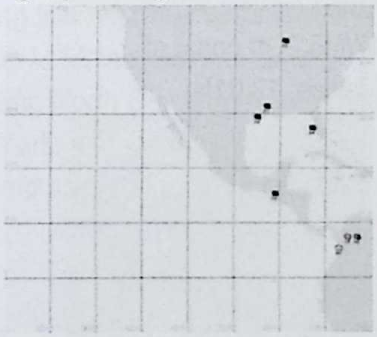
Aug.29,2017

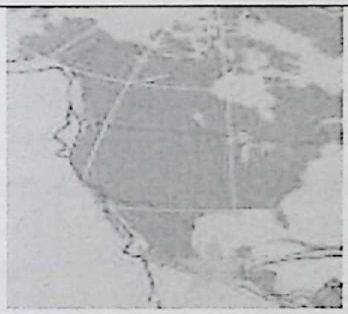
Mexico;18.22N; 97.61W.

Aug.29,2017/M 4.1 Chiapas, Mexico; 16.44 N; 93.69 W.

US Southern Gulf States
(30.11N 93.20W)
(29.96N 95.35W)
(29.95N 94.01W)
Catastrophic and life threatening flooding" spreading from Texas to



Aug.30,2017
Southern Gulf states, US
(30.11N 93.20W)
(29.95N94.01W**360mm**)
(29.96N 95.35W)



Aug.29, 2017/M4.2 Offshore Oaxaca, Mexico;15.43N; 96.83 W.Aug.29,2017/M4.5 Oxaca, Mexico; 15.96 N; 96.54 W.

Aug.29, 2017/M4.0 Offshore Guerrero, Mexico; 17.30N;

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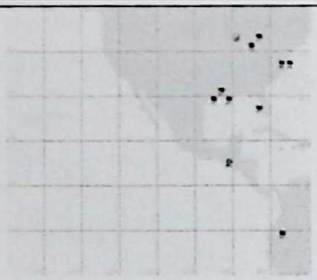
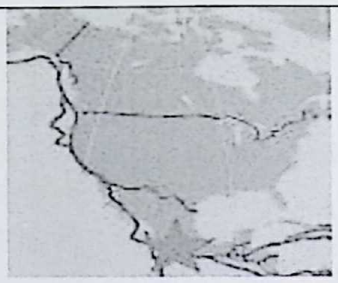
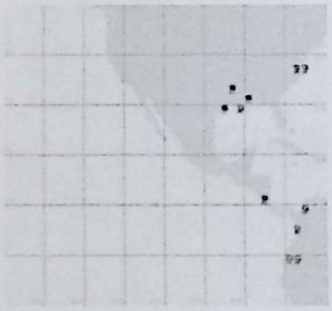




Aug.17,2017/ M 4.4 Offshore Oaxaca, Mexico;15.50N;

Asug.30-31,2017
US south
(32.45N93.83W84m)
(30.68N88.25W67m)
(29.98N 90.25W 9m)
(29.95N 94.01W 7m)
(29.96N95.35W33m)



Aug.30,2017/ M 4.0 Offshore Oaxaca, Mexico; 15.64N; 96.24 W.

Aug.30,2017/M5.2Off coast of Guerrero, Mexico; 13.01N

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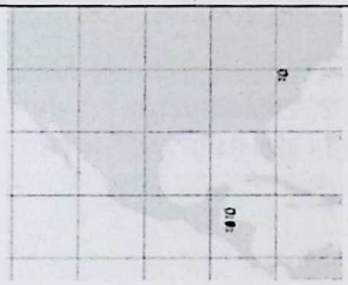
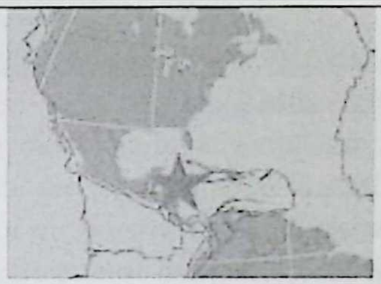
3. **Winter Storm Grayson:** Bomb Cyclone followed by **Jan.10,2018/M7.6 North of Honduras (continuous warning ignored)**

Jan.01, 2018 SE US (38.88 N 79.85 W 609m)	**Jan.10,2018/M7.6 North of Honduras: 17.40N 83.48 W**
 Jan.03,2018 **Winter Storm Grayson** On January 3, blizzard warnings were issued for a large swath of the coast, ranging from Norfolk, Virginia all the way up to Maine. Several states, including North Carolina, New Jersey, New York, and Massachusetts declared states of emergency due to	 Strong earthquakes Of M6-7+ impending to hit near Florida and Caribbean region in 2-4 weeks. Authorities must be in extra alert. 4.6 N Guatemala; 15.49 90.52 W. Jan.07, 2018/M Offshore El 12.75N; 88.15W. 5.1 Salvador

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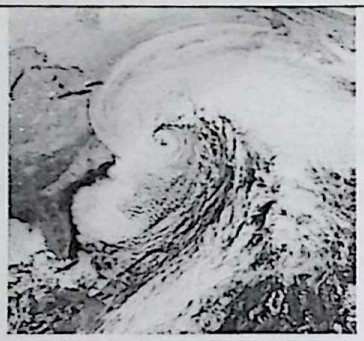
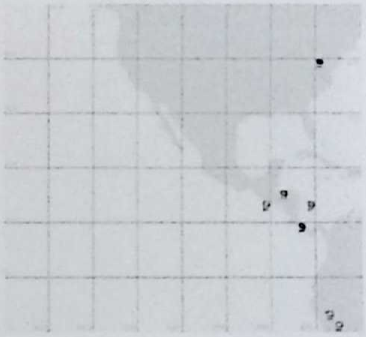
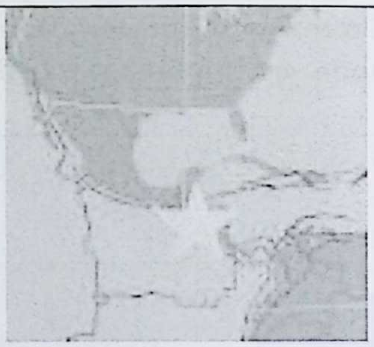


Jan.04-05,2018
Honduras
(15.73N86.86W26m)
Guatemala
(13.91N90.81W2m)
Colombia N
(13.36N81.35W)
Costa Rica
(10.00N83.05W3m)





Jan.07, 2018/M4.4 Virgin Islands;18.87N;64.97 W.

Jan.10, 2018/M4.8 Costa Rica;10.67N; 85.01W.

Development of Successful Advance Earthquake Prediction Systems using Absolute Geo Thermal Energy Contribution Assumptions

S. Prakash, Dr. A. T. Ravichandran and Dr. R. Chandramohan

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Our Collaborative Work

Abstract

Advance prediction of earthquake is one of the major global requirements of importance that would save many precious lives and material losses. Though a reliable prediction system is yet to be realized a new insight on the prediction of earthquake before its occurrence well ahead has been arrived in this study by considering the geo thermal energy associated with earthquake precursors causing the weather changes and as responsible for creating anomalies from normal seasonal variations over the crust in classified zones. This will add to our understanding and realizing of a strategy to better manage this monster disaster. The authors attribute the geological processes arising within the earth's mantle and core as responsible for the present climatology and have made many successful predictions earlier. The aggregate of the geological physical processes of overriding and subduing plates that liberates enormous amount of frictional heat may cause huge variations in temperatures. Particularly in Island rich ocean basins the atmospheric anomaly arises frequently and those regions are also associated with high seismic activities. This strategy realized can be easily incorporated to the global monitoring and warning systems and can help alert for earthquakes above 4.0 in the Richter's scale.

Keywords: earthquake early prediction, preparatory phases, Geo thermal energy release, Mechanism of anomalous weather, precipitation anomaly

Introduction

Worldwide efforts to look for strategies that would save from the loss of thousands of lives during Earthquakes are on the increase with the rapid advances in sensors and computation capabilities. On one side the cause for global warming is under study and better strategies are needed to save our planet from human activity. On the other side earthquake events like the one in 2004 threatens mankind and drives it to search for better strategies to manage such huge natural challenges. Both gives our limitations and need for creating harmony with nature and our consciousness to love nature. Though there are several papers published on earthquake prediction but none is capable to warn successfully a single individual earthquake. The main reason of no success in earthquake prediction is the failure to understand the correct precursor by the

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main stream researchers and scientists. Even correct precursor proposals by non-main stream researchers are simply ignored or termed as unrealistic. Earthquake early warning (EEW) aims to provide sufficient time for preventing disaster before the strong ground motion arrives. Traditional methods of ground motion prediction for EEW predict the peak ground motion and trigger an alarm when the ground motion is predicted to be above a specific threshold. They can be classified as front detection, on-site, and network methods.

Despite the devastation that earthquakes, the tsunamis and hurricanes cause and continue to wreak, the methods of quickly determining an earthquake's occurrence and its magnitude remain insufficient. The most common method of establishing an earthquake's magnitude is using seismic sensors on the ground that measures the shaking of the earth's crust.

The advent to satellite based communication systems have enabled NASA to suggest various measures to use 5000 mobile alerts from locations of epicentres to provide rapidly the evacuation sites and their movements which is lauded by many workers. Currently many efforts to identify in advance and predict earthquake occurrences are attempted. The probability of success of several predictions seemed to be important rather than the process by which the predictions are made. Recently "NASA' saw the potential, and had the know- how, to take GPS to the next level to help provide more accurate and timely information. To enhance the accuracy of GPS data, NASA's Jet Propulsion Laboratory and Scripps Institution of Oceanography have upgraded scientific GPS stations with sensors that monitor for earthquakes while collecting GPS, pressure, temperature and seismic data in real-time across southern California. The weather data is used to account for the water vapor that the GPS signal travels through, thereby enhancing the accuracy of the GPS data. The stations then send the information to Scripps via the internet and radio waves—which travel faster than shock waves—where scientists use the GPS data to measure exactly where and by how much the ground moved during an earthquake. The GPS data are then inputted into computer models to estimate the earthquake's location, magnitude, depth, and tsunami potential. This can all happen within minutes, enabling rapid and more accurate earthquake data than ever before. However this will be useful only after the earthquake is commenced.

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Whether Weather Helps?

Herodotus (born c. 490 BC) recounts that stillness both precedes and creates earthquakes because the winds are bottled up in a cave. He has written "Everything is quiet, in fact everything is far too quiet. People get uncomfortable but they don't know why "Earthquake weather,". Animals equipped with extra sensory power to sniff the weather in advance do have indicated that information's about the earthquake precursors initiation are attaining a critical point is available in advance. Though a great deal of research continues worldwide to predict short term earthquakes reliably but unsuccessful. This prompted the group to look in for signatures. Few predictions were made and conveyed. The successful events though accepted in principle a deeper insights and detailed probe were needed for publication.

Recent calculations suggest that in excess of 9 per cent by volume of the Martian mantle may contain hydrous mineral species as a consequence of surface reactions, compared to about 4 per cent by volume of Earth's mantle. The relatively buoyant magic crust and hotter geothermal gradients on Earth reduced the potential for upper-mantle hydration early in its geological history, leading to water being retained close to its surface, and thus creating conditions conducive for the evolution of complex multi cellular lives. This suggests that it is the geology of the earth that is responsible for retaining water and causing seasonal variations.

Careful analysis of the seismic data reveals that anomalous atmospheric weather changes are always followed by seismic events in the nearby places, on sites wherever the geological condition favors' relationship between atmospheric weather changes and seismic events do exists and have been reported and predicted by few earlier also with relevance to few countries. However a clear route to predict in advance by observing the anomalous seasonal variations from the estimated season from the observed season has not been applied for many regions. Gosami et al have calculated rainfall anomaly in certain earthquake regions in India and concluded that in few places the anomaly effect can be correlated with severe earthquake occurrence. However, their calculations disagree at few places like Uttarkasi. The deviation has been attributed to distance of the location from sea shore. Their calculations have revealed the importance of geothermal energy in creating atmospheric anomaly. "It may mean the thermodynamically favorable conditions for these storms are migrating poleward,.

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{Yanluan Lin et al }. This study is first of its kind in predicting in advance many earthquakes of magnitude above 5 Riechers's Scale. A claim that was considered groundbreaking led by University of Miami (UM) scientist Shimon Wdowinski shows that earthquakes, including the2010 temblors in Haiti and Taiwan, may be triggered by tropical cyclones (hurricanes and typhoons), according to a presentation of the findings at the 2011 AGU Fall Meeting in San Francisco. Minghua Zhang, Stony Brook University School of Marine and Atmospheric Sciences (SoMAS), Nature Communications stated that "tropical cyclone precipitation will be stronger when sea-surface temperatures are higher, but is not clear whether the stronger precipitation is associated with higher intensity rates or larger areas, or both," explained Zhang[ ]. "Our study showed that if the sea-surface temperatures are uniformly higher around the cyclone region, the cyclone sizes will be similar to the affected tropical zone." Such studies do indicate a possibility of triggering by weather which is not dealt here in this paper.

The researchers analyzed 1,142 tropic cyclones worldwide by using high resolution space-borne radar and microwave measurements of precipitation aboard NASA's Tropical Rainfall Measuring Mission (TRMM) satellite and tropical cyclone track data from the International Best Track Archive for Climate Stewardship22 program. They investigated the controlling factors of each of the tropical cyclone sizes and found that the relationship of the cyclone sizes with the intensity of the cyclones, combined with the absolute values of SSF together are weak, but the relationship between the relative values of the SST and the cyclone sizes is strong. However, "This research was conducted in the context of climate change, and their findings helped understand what controls the sizes of these storms and what measurement data are needed to better predict the impacted areas they cover," said Professor Zhang, who conducted research on the theoretical explanation of the relationship between the tropical cyclone size and SST. "We were able to also provide a theoretical explanation to this strong relationship with relative SST and confirmed the results in numerical model simulations," added Professor Zhang.

Though connection between weather and earthquakes were predicted earlier the assumptions could not reveal the secret that "All weather anomaly is associated with an earthquake event and all earthquake occurrence do not have weather anomaly". However, this study and claim is by assuming totally the reverse of what the reports

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suggest. The Geo thermal energy triggers weather and earthquake and weather changes arrive first followed by P, S waves and shocks. The lag behind weather anomaly and p wave arrival may be predicted at the zones of influences map prepared by the principal author Prakash. The Prakash point in the Zones will indicate the criticality of the epi centre well in advance and may be integrated with the warning system.

Method:

The very basic feature required to predict an individual earthquake is event like rainfall (one of the weather changes). This concept shows the relation between rainfall or snowfall (any form of weather changes) and earthquakes (seismic activity). The worst natural disastrous atmospheric and seismic events are intrinsically, permanently and inseparably coexist in nature. They are subtle in one within another and not realizable, visible through normal eyes. Rainfall events are predominant in temperate zone and snowfall events are predominant in Frigid Zone. Like lightening followed by thunder, weather activities are followed by corresponding seismic events. Hurricane, snowfall and rainfall events come first then followed by seismic events in the nearby corresponding places. The island rich ocean basins classified in to earthquake prone zones and rain fall monitoring data may be inspected periodically for an anomaly. When present then the nearest epi centre is already ready for receiving the P waves. The strategy if explored in details would certainly predict exactly the earthquake minimum one day to 2 weeks in advance.

As with the same destructive potential geological energy also determine the energy for both atmospheric and seismic events. The resulting magnitude of an earthquake in proportion to the severity of hurricane strength, rainfall or snow fall and also site geological conditions could be estimated. Rainfall events are the observable physical phenomena or precursor to predict short term earthquakes. There is no long term earthquakes prediction that could be impossible too. However, a deeper insight is arrived in understanding that would help better management of occurring disasters.

Different web sites provides different information on weather, one gives the very useful information about the location of rainfall; another gives the storm history and satellite images gives cloud data and could be monitored over the epicentre area with ease. Whenever an anomaly is observed the extent of anomaly can be correlated with the energy expected for this anomaly. An empherical relationship do exists

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between weather anomaly and earthquake site up to a certain distance and this zone of influence may be estimated and complimented with other warning systems like Tsunami warning systems, Hurricane warning systems to enable the direction of mass movements and evacuations for disaster management teams.

Most earthquakes happen at the nearby places of rainfall event up to 20° variations in geological coordinates, usually in 1- 15 days to few weeks (2-4) and only in few cases it takes more than 4 weeks. Just on seeing a rainfall indication above 50 mm on a weather map we can expect future earthquakes of magnitude 4-6 may be on the horizon to the nearby places of rainfall. Earthquake of magnitude above 8 will come only to the nearby places of incredibly unexpected historic weather changes. The confident level of happenings of earthquakes to the nearby places after weather changes is 100% with the variation in expected precise location (depends on the location of origin of weather changes eg. a cyclone can move thousands of kms away from its origin) and magnitude (severity of weather also depends site geological condition). A detailed strategy needed with a flow chart is provided in the supplementary data fig 1.

Prakash Limit:

After Careful analysis of the various data on the assumption that The chaotic atmospheric effects may be negligible and assuming only the geothermal energy release from the known epicentres control the atmosphere the Principal author has observed that an anomaly above 49 mm of rainfall will necessitate us to use this early warning system. When rainfall is 50 mm the anomaly is 1 mm. Then the strategy shown will indicate a warning of earthquake of 4 magnitude near the nearest epicentre location. The disaster assessment team can be alerted to plan their own strategies in advance. When the factor $X < 50$ we can expect a earthquake between 4- 5 Richter scale. When anomaly in rain fall exceeds and or accompanied by extreme heat wave emission leading to forest fire then the magnitude is between 6 to7 Richter. When anomaly exceeds 50, heavy snowfall and major change in the ocean tides leading to tsunami are noticed the magnitude is greater than 7 Richter scale. The time lag between weather anomaly notice and occurrence of earthquake and arrival at epicentre may be 10 to 15 days.

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World of precursor area and the corresponding epicentre zones have been summarized and presented in the supplementary data. In these area both the rainfall and the earthquakes happen repeatedly and in recurrent pattern is significant to mention herein tables.

Number	Region	Page
1	Pacific West	3
2	Pacific East	10
3	Atlantic North & South	19
4	Atlantic South	20
5	Europe Mediterranean Sea	21
6	West Asia	26
7	Indian Ocean–East & West	28

Table of Various Regions and Zones are provided in Supplementary Information

Conclusion

This study suggests that by understanding the earthquake pattern of occurrence, the rain fall data and the nature of anomaly it is possible to develop an early earthquake warning system well in advance. The consequence of early conditions associated with earthquake process are attributed as the cause of major anomalies in the rainfall events occurring near epicentres the energy released as geo thermal energy is used predominantly for the anomaly and a possibility of evolving a protocol in a much simpler way has been suggested.

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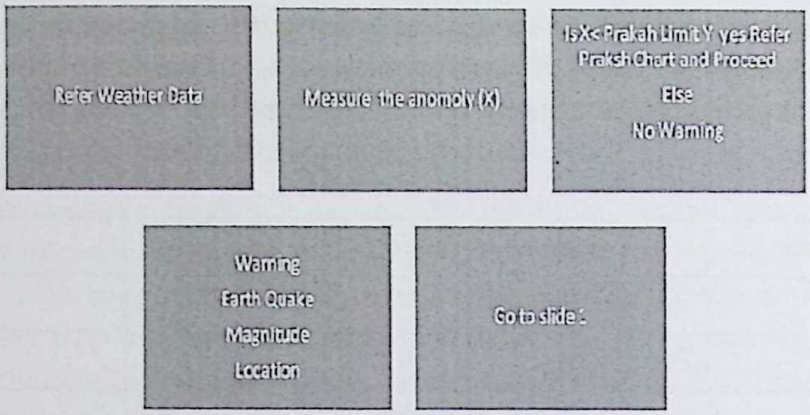

Fig1. Block diagram of strategy to develop EEW system.

They appeared in Science in 1982 (vol 216, p 185), along with Lovejoy's tentative claim that they might just be linked to Richardson's outlandish idea. In the following years, Lovejoy teamed up with Daniel Schertzer, now at the University of Paris East, France, and set about searching for evidence for multifractal power laws lurking in weather data. They focused on rainfall: a meteorological phenomenon whose familiarity masks the complexity of its origins. Triggered by a delicate balance of atmospheric factors, rainfall is tough to model even using the most powerful supercomputers. Yet by analyzing data from the rain- detecting radar network around Montreal, Schertzer and Lovejoy found evidence for an underlying simplicity to the process.

The radar data allowed them to plot the amount of rainfall in an area, as they zoomed in and out at different scales. The researchers found their plots could be described by power laws with different exponents - a strong hint that rainfall is a multi-fractal process, with the underlying physics cascading down to ever-smaller scales. While intriguing, the discovery was far from compelling. For a start, the data only allowed Schertzer and Lovejoy to extract power laws spanning scales between about 100 kilometres and 1 kilometre. To properly support their theory that the atmosphere is multi-fractal, they would have to show the scaling laws still held out to scales of tens of thousands of kilometres - the size of the entire planet. The team realised that one source of meteorological data was up to the job: orbiting satellites.

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Scanning the planet evenly and in great detail, they build up a consistent picture at scales ranging from a few kilometers to the whole planet. And Schertzer and Lovejoy realized that a satellite launched in 1997 by NASA and the Japanese space agency JAXA could allow them to put the multi-fractal theory to a truly global test. Orbiting the planet every 90 minutes, the Tropical Rainfall Measuring Mission (TRMM) peers down on a broad scale weather of the Earth with sensors that detect the tell tale signs of rainfall on scales down to a few kilometers. Together with their colleagues at McGill University and the University of Paris East, Schertzer and Lovejoy analyzed 1200 consecutive orbits of TRMM, looking for signs of multi-fractal behavior in the atmosphere.

Earlier this year, they published their findings in Geophysical Research Letters (vol 36, p L01801) - and they were simply stunning. The satellite data generated a beautiful collection of fractals and followed power laws on scales from tens of thousands of kilometers down to about 10 kilometers. "It's rare that fundamental theories that have been marginalized for 80 years are suddenly and decisively proven," says Lovejoy. "Yet this is what we believe we have done for Richardson's idea that atmospheric dynamics are cascade processes." It's rare that fundamental theories that have been marginalized for 80 years are suddenly and decisively proven effective.
Earthquake predicting methods:

There are many Predicting Earthquake and casting using different methods.

1. Jack Coles uses electronic devices like Radio, T.V waves to Predict Quakes. He hears static on tv and Radio interprets like ear tones uses. Interference noises on T.V, Phones, Radios. He used a $ 50,000/- Frequency analysis to pick out noises which was helpful. 57% Predictors Saying the 'P' word. According to Prof. Roger Bilham at Boulder earthquake prediction is not possible.
2. Try penny Theory: If a fault in highly stored and about to break, then some minor force such as tides or the alignment of the sun and moon may be enough to set it ifP wave velocity (Dilatancy), computer picks of fore wave shocks etc, many continue to predicting an amateur without any government findings.
3. The predictors: Marsha Adams: Electro biologist at Stanford Research Institute - sensitive of plants, animals, fogs etc. Vladimir, Keilis, Borok, UCCA seismologist and geophysicist – impossible to predict earthquake Kellis - Borok

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and his team from Russia – No evidence – by measures daily earthquake units. Iben browning – Biologist 50% two days in advance by observing tide for on.

4. Eddie Schwarz – radio waves and pets Lowell Whiteside and Michael J.Kozuch. This is due to treat earth as a white object and the physics doing pattern recuperation and earthquake statistics.
5. A holistic approach Z Honghao shou (cloud man) along line shaped cloud with a tail points in Northwest direction for stronger earthquake.

Animals may sense magnetic energy, chemical energy, or P waves, piezo electric signals, temperature, electrical. In Japan 1700, 2 days after a super quake near Washington (US) causes Tsunami in Japan.

Prophet Nostradamus's Forecast:

Michel de Nostradamus – world renowned prophet of yester year born in 1503 at St. Remy province in France, four-line poems or quatrains

Remember the future: The prophet Nostradamus. "Mercury in Sagittarius, Saturn fading "is an astrological Position that will occur in November 2015, November 2016 and December 7 2044.

Forecast on LosAngels.

All under continental plates the friction from subduction melts release, creates magma chambers, and feeds valances. All volcanoes are over active subduction gives an over hot---yellow or Hawaii.

The sloping park great calamity to be done through Hesperia and Insubria The fire in the ship, plague and captivity, Mercury in Sagittarian Saturn will fade, Lunar phases give maximum tides, which gives maximum vulnerability to quakes. Abnormal animal behavior, Geyser, and spring activity, magnetic aberrations etc, provide confirmatory data for where and how big?

Molten earth's past and present warnings are always there. we have to listen,

"The experts of high science state that earthquake production is currently a scientific impossibility, I maintain that the topic is too important to leave to the experts and I continue to be the impossible with the better than 75% batting average.

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Second most powerful fixed in May is a god of earthquake. "QUAKELESS"

1. Jupiter effect theory
2. Psychic archaeologist Jeffrey Good man earthquake generation
3. Unique and unjustifiable prediction by Stock Market Analyst.

Earthquakes are going to continue to occur whether or not they are predicted.

If California were not famous for earthquakes, we would have twice the populations.

-Jim Berkland

Maximum tidal forces help to tell us when but not where or how big

-Jim Berkland

As for gravity, the combined forces of all of the planets when aligned is far less than 1000 the effect of moon alone.

- war and peace

The train always comes when one's watch displays a certain time does not mean that the watch causes train coming.

1. Earthquake precursors:
   Clouds: Strange clouds seen before earthquakes, earthquake weather.
2. Electrical activity in the ground:
   Ground current fluctuates before earthquake. VAN project in Greece ------ Varotos, Alexopaulas and Nornicos of University of Athens electric field measurements between electrodes buried in the earth to predict earthquakes.
3. Changes in rock behaviour:
   Rocks under stress changes as seismic wave travels through them. Waves from distant earthquakes travel through the earth's crust that we are interested in and hence you can detect changes that may be the precursors of an impending quake.
4. Ground water change:
   Regular monitoring of wells accurately will tell anomalous discharge or depletion before earthquakes and after.
5. Radon:
   A gas which is radioactive found in rocks and changes in stress affect ratio of valence physical precursors.

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6. How animals detect:
   Sensitivity to electrical changes in the movement. Earth's crust contains 15% quartz and in some places 55%. Tributes says the piezo electric effect in quartz is capable of generating enough electrical energy in an account for the creation of air ---

Charlotte king predicted biologically from her own body conditions the earthquake, and volcanic eruptions Mar 27, 1980 of Mount St. Helens (www.viser.net/~charleng/info.html)

Popcorn theory:

Carbs such as popcorn have naturally calming effects which may be attributed to brain chemistry. According to MIT research eating carbohydrates gives up level of serotonin, natural tranquilizer found in the brain that can help people calm down.

If you ignore your dreams, you may never live them-Jim Berkland

Jim Berkland had a dream 14 to 15 days prior to an earthquake that long dead faiths came in dream and cautious about 100 earthquakes. Dream research craigweb, executive irector of Dream's Foundation in Montreal Quebec, Canada. Psychic prediction:

Sentiment without action is the rain of the soul–Edward Abbey. Man's capacities have never been measured; nor are we to judge what we can do by pedants no little has been tried – what people say you cannot do; you try and find you can. - Henry David Thoreau

The Dynamics Proposed:

In nature the cause-and-effect theory is well understood mechanism for estimating anything. In 1918 an unseen virus produced 5 crore deaths. In 2019-2020 a virus COVID-19 killed lakhs of people. It's very difficult to believe. But it happens.

Alaskan full moon day March 28th 1964.

Nilgate earthquake in June 16 1964 happened after solar eclipse. Hucheng, China (9)5 January 27- February 3, 1975 seismic window on February 3, 7.3 R earthquake happened. Chinese gave warning in January 13 for an earthquake in June 1975. But it happened in February 3. Perigean springs tides perigee and spygy occurred

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on the same day. 10,000 peoples died. Animals, birds, activities were different over a radius of 155 miles from epicentre bio seismic reactions. Marsico1985 killed 9500 people.

The hardest thing to predict in the future, but I'm working on it. Jim Berkland Prakash San Fransisco – before 2030 – 6.7 quake Calaveras concord - green valley, Mount. Diablo thrust -green Ville faults before 2030

They calculated 25% ozone of San Gregerofault 6.7 at coastal areas before 2030. In next 30 years 7 earthquakes at San Andean prude or Rogers gate fault.

Dilatancy Diffusion: In1973, Christopher Scholz, LynnSykes and Yah Aggarwal of Delmont – Do hertz earth observatory proposed dilatancy – diffusion theory DDT micro cracks form that fill with water and weaken rock. Dilatancy is the tendency of the coarse soils that transit fluids to behave like quicksand if shaken. The theory is a failure one.

Seismic Gaps:

When one spots many places in a belt of high seismic activity, where there is no major earthquake and there were one on either side then the gap is prone to subsequent earthquake of layer magnitude.

Stern Transfer:

The layer earthquake that releases steps is passed onto another part of the same fault or to a neighboring fact. These sterns transfer or dislocation is a good precursor to which.

Time Predictable:

The time between the occurrence interval of successive quakes at the same place and duration may enable predict next time and duration of occurrence? When I was in Taiwan, I experienced unique head ache and later can correlate with earthquake of 4.5 Richter magnitude in2004. Many people have reported similar headache symptoms a killer –migraine, living at 7.1 magnitudes Earthquake. Largest number of women when compared to men has reported these symptoms. The pain and precious end before an hour of the earthquake. This is due to the fact that human forehead has large amount of magnetite.

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Ear tones or ringing in ears is another sign of an imminent earthquake. The ear which is sensitive for many human may indicate the direction from which earthquake originates. In November 2004, Lee Cheng-Chi, a resident in Taichung, Taiwan, got a personal ear tone warning in the direction of Chan attire region. He predicted a 4.1 earthquake in November 12 and has warned to his friends about this quake. Few days before actual earthquake and he predicted 5 Ritchter scale earthquake in November 12 or 13 during 2004. Chandramohan was a post doctoral at that time at National Chang-Hua University of Education, Chang-Hua. Earlier he predicted 7.0 quake of October 2004 also. However, he had failed to predict few earthquakes of higher magnitudes.

Brownian Movement

Earthquake happened in Florida in the sun shine state October to January. December 22 1945 – Primary window October27–Secondary window January – Primary window---- of seismic windows zones. In earthquake region: Low priced insurance for 100000/- annual insurance $17 per year gives peace of mind.

Virginia earthquake happened after spring tide of the secondary seismic window.

The east coast earthquakes history shows the significance of the secondary seismic window following perigean solar tides.80% of the 6.0 plus quakes occur within the Ring of Fire notes "Berkland".

The modern brawling Coles are similar to California for Taiwan hence seismic devices----------

Month of June is high on the less of good time for past bad earthquake and Indonesia and slept for a while. Later after his predictions except for the date all where as if he forecasted. He said he has classified the zones of the world with past history of occurrence and s. He will look for the climate predictions. Whenever there is an anomaly, he expects an earthquake at the in the radium 250 km from the anomaly. Few weeks later he was getting treatment for his lung cancer and paid a bulk of his savings periodically for his treatment. Still his energy was used only for prediction. He said unlike the experts of earth sciences, the people of the land can predict the earthquake easily by their native knowledge. But their voices are often not heard and neglected. It's the earth's desire to communicate everything hidden to the human being to advance

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their knowledge to support life. However, we are neglecting the symptoms. Rainfall is definitely a nice precursor and the climate is absolutely decided by the earth, He argued. I needed a short vocation after my retirement and I wish I should narrate why this soul, its cry and the warnings be recorded. I had my brother who once lived in the Gujarat state near Bhuj which is close to the Himalayan earthquake from region. He is a ground water scientist. I had extensive discussion with my friends who are contemporary geological and geophysical field. To name a few my own brother and Senior Hydrogeologist, Mr.R.Arumugam, my best friends Dr. K. Kumaresan, Mr. Sivashanmugam retired from Central Ground Water Board, Dr.Sundararaman from NIIT, Trivandram, Dr. Udhayana Pillai retired Geology Professor and many more faculties of our clusters during conferences.

Maker (nick name calico) from her left ear predicts. Recording your dreams and correct the occurrence is also possible only empherical.

Around faults due to the changes in the local dew point and mass above the crust of the epicentre zone and frictional heat weakening the plate strength tectonic plate fracture occurs as earthquakes. However, the released heat is absorbed by the atmospheric air and distributed by wind to a favorite H or Low pressure region L causing differences over land and sea. This is a natural radiation process. The air close to heated land rises above. However, the land is also heated by sun all around which is also a component of climate over the surface.

Precursor to pre-earthquake precursors:

In the above sequence of natural events before earthquakes, one event is the precursor for the advance event. In this way tectonic plate motion is the precursor to atmospheric weather anomalies and the pre-earthquake precursors supply energy for creating the anomaly that can be measured by the climate data.

Inherently large events: The surface of the Earth is made up of nine major tectonic plates, 10 minor plates, and a much larger number of micro plates. These plates float on top of the viscous, the upper layer of Earth's mantle. Because of thermal changes in the mantle, tectonic plates are always moving. The fastest-moving plate, the Nazca, only travels about 160 millimeters per year. Identification of centrifugal force, the major driving force for plate tectonics.

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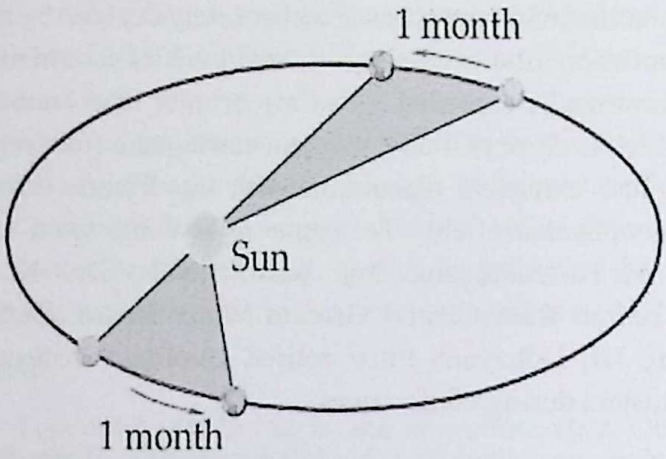
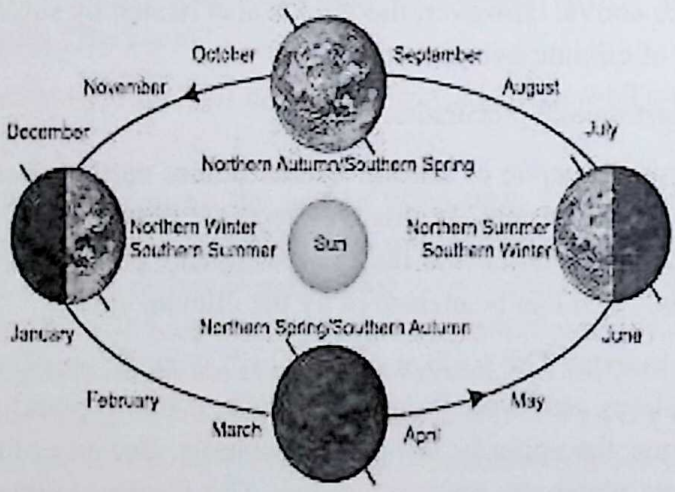


As the earth gets closer to Sun, it moves much faster in its orbit. This causes relative plate motions. There would be no seasonal variation on earth if there are no orbital motion of the with 23.5 tilt in association with plate motion.



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Where plates meet, they form a variety of different boundaries depending on the direction of their motion. Transform boundaries, for example, are formed where two plates grind against each other as they move in opposite directions. Divergent boundaries are formed where two plates pull apart from each other (the most famous example is the Mid-Atlantic Ridge, where the North American and Eurasian plates diverge). Convergent boundaries are formed wherever two plates move toward each other. In the collision, the denser plate is typically subducted, meaning it slides below the other. The earthquake processes are inherently large events but not complicated or complex in nature, they are always in correct order.

Large tectonic plates, large process of plate motion, large amount of liberations of plate frictional heat, provide large way of generation of atmospheric weather changes, generation of monster storms with potentially destructive energy cause heavy rain accompanied with strong winds, huge flood and devastating nature of seismic energy released. Even though events are inherently large but quite easy to observe and verify the correctness of the events are close to 15 days.

In the faults that extends few 100 km at a depth around 10-50 Km below the crust when the stress accumulates beyond a certain point called yield point the tensile point optimum is reached and when this tensile point exceeds a break point is reached. Between Yield point and tensile point stage, tectonic plates liberate massive amount of frictional heat that causes atmospheric weather anomalies; the interval between tensile point to break point, the massive amount of tectonic plate frictional heat weakening plate strength facilitate earthquakes.

To understand this let us assume a passenger travelling on a curved path and tests the tensile strength of a steel plate. Let us assume that earth with tectonic plates as passengers travel in a train or bus on a curved path. Tectonic plate motion due to Centrifugal force is similar to the experience of passenger travelling in a train or bus on a curved path. Testing of tensile strength of a steel plate in a Universal Testing Machine is similar to tectonic plates under stress due to tectonic plate motion. The state of tectonic plate fracture, above an epicentre zone undergoes a progress by accumulation of energy to move beyond yield point; tensile point and break point. However, the the displacement is prevented by the centrepetal force which compensates partially.

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During the period of yield point:

At yield point tectonic plates of zones are set more active. The initial plate motion is the pre-precursor to all other pre- earthquake processes. If the whole of energy is carried by the atmosphere and a heavy prolonged rainfall season is formed then nature has found a way to reduce the accumulation of more energy. If the accumulation process is still in progress and cannot be quenched then more and more energy gets accumulated and are released in unison as a massive earthquake of magnitude around5 through the cracks in the known epicentres. Now we can see the previous history of earthquakes of that region and mark them as pre or post shock.

From yield point to Tensile part:

Generation of atmospheric anomalies around zone is due to the liberation of massive amount of plate frictional heat. Weakening of tectonic plate strength facilitate brittle fracture of earthquakes. The strength of the tectonic plates is not constant over these tectonic plate movement processes.

The most significant breakthrough:

Identification of centrifugal force, the major driving force to tectonic plates, identification of more than 250 epicentre zones and equal number of precursor areas and identification of pre- precursor process like pre-earthquake process are the most significant breakthrough of this observation study. While USGC and New Zealand and JA observations have a mapping of the earthquake zones some zones are not fitting our mapped zones but some zones overlap in certain regions. While there are two zones adjacent as in India, Indian Ocean, Java Sumatra regions, the anomaly region is missed in the data of one zone, where one zone in land and other zone in water. Hence the main part of the study is classification of zones to the identification of precursor to pre-earthquake precursors and seeing all overlapped regions in a single global chart or table of 250 zones.

Earthquake prediction criteria:

Observation results not match with the present-day criteria because of the classification of zones. However few data may match. For example with the USGC zones our prediction may have mid level correlation as the zones of USGC are much wider range.

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Centrifugal force always keeps the tectonic plates in motion:

The orbital motion of the earth around the Sun determines and controls the overall plate motion at the corresponding epicentre zones. The duration of intense plate activities is depending upon the particular position of the earth. The position of the earth for a particular duration of time, during its rotation and revolution is responsible for the particular epicentre zones to exhibit atmospheric and seismic anomalies. The same phenomena observed prior to earthquakes in mainland, off coast and offshore earthquakes at different epicentre zones of earth's hemispheres year after year also vary. The force due to the orbital motion of the earth, responsible for seasonal variation brings potential atmospheric and seismic anomalies. However, with varying severity level of processes for over 100s of years, seasonal weather and seismic activities has created some patterns which are altered slowly.

Classification of Zones:

Let us assume now that all form of atmospheric perturbations is triggered energy released by corresponding epicentre zone. Then each and every individual form of weather phenomenon is followed by seismic activities. Intense heat wave condition; heavy snowfall; tropical depressions and rainfall locations are followed by earthquakes. Among them rainfall location is the best and quickest to identify the impending earthquake location. In the daily rainfall /snowfall map the icon is the representative of the amount (>50mm) and location of rainfall and snowfall, however, rainfall location is the prerequisite requirements for earthquake prediction in this observational study. Epicentre zones are in less than a mile to hundreds of miles away from the rainfall or precursor area. With respect to the position of the earth, there are two processes naturally occurs at the respective epicentre zones due to tectonic plates motion - atmospheric and seismic anomalies. For example, for a particular position of the earth, only particular epicentre zones are atmospherically and seismically more active. When the earth moves to new position, a new set of epicentres are set to more active, so the previous epicentre zones are less active. However, all epicentre zones are always in active, so earthquakes of M<4 always occurs but not recorded here. The Global Seismic Hazard Assessment Program was a multi-year project sponsored by the United Nations that assembled the first consistent worldwide map of earthquake zones.The project was designed to help nations prepare for future earthquakes and take

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steps to mitigate potential damage and reduce deaths. These scientists divided the globe into 20 regions of seismic activity, conducted research and studied records of past quakes. However in this study further dividing the region is suggested with 250 Zones and the fault zones with s are mapped.

Pilot Study:

The Observations of atmospheric anomalies associated with earthquakes was first observed in Hindu Kush region, Afghanistan in the year 2008. Under similar atmospheric anomalies similar observational approach have been expanded to other parts of the seismically active regions. Recorded data details have been used for the same regions for different times. After continuous rigorous meticulous study and observation, it has been confirmed that earthquakes occur after all happen to the nearby places of rainfall. Significant progress has been achieved by this study, so similar approach have been applied to other regions to predict earthquakes reliably. There are specific latitude and longitude epicentre zone ranges on earth hemispheres. For every year, only within this epicentre range earthquakes occurs within or equal to 5° variation in latitudes and 15-20° variation in longitude from the location of rainfall.

The most seismically active areas are hundreds of miles away from the area where the rainfall is occurring sometimes making the link between cause and effect very difficult. Hence understanding the Zones of influence and pattern is very important. If we compare these to only 20 zones there may or may not be significant correlation.

For instance, the specific significant epicentre range for Honshu, Japan is 33-39N 139-142E. The earthquakes occurs only within this epicentre range, equal or within 5° variation in latitudes and 10-20° variation in longitude with respect to the rainfall (precursor) location range 31-40N 122-140E as from the record of past rainfall location. However, the corresponding epicentre location useful to predict future earthquakes of M>4 lies at Honsu and hence occurs at this region. From our understanding the epicentre releases the energy which is taken away by a quenching mechanism that causes precipitation or climate. When the excess energy is quenched and still more supply is available the processes compete until they reach equilibrium. When the equilibrium is reached and the precursors attained optimum the rest of energy appears as love wave and earth shake.

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Criteria for earthquake prediction(observational):

Though there are several form of atmospheric weather anomalies, rainfall location is best suitable to assess and predict the exact location of impending earthquakes in the corresponding epicentre zone.

Amount of rainfall:

greater than or equal to 50 mm; one or more days that are happening 15 days before earthquakes.

Magnitude frame:

4-6 on Richter scale (only on record weather changes the resulting earthquake magnitude 6 and above observed) depending on severity of weather and site geological condition.

Time frame (interval after rainfall):

normally in 15 days and in exceptional case 2-4 weeks.

Epicentre frame (location):

in all the normal cases within 10° latitude and within 20° longitude nearby rainfall location.

Epicentre depths are not considered significant and can be estimated later by other methods by ionosphere measurements or Radon content in water.

Epicentre direction:

The location of storm formation and the direction of intense heat source from epicentre zones also may be considered.

Careful analysis of the seismic data reveals that anomalous atmospheric weather changes are always followed by seismic events in the nearby places, on sites wherever the geological condition favors. A relationship between atmospheric weather changes and seismic events do exist and have been reported and predicted by few earlier also with relevance to few countries and endeavors to develop a warning system based on anomaly in weather were also of considerable interest. However a clear route to predict in advance by observing the anomalous seasonal variations from the estimated season from the observed season has not been applied for many regions. Gosami et.al have

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calculated rainfall anomaly in certain earthquake regions in India and concluded that in few places the anomaly effect can be correlated with severe earthquake occurrence. However, their calculations disagree at few places like Uttarkasi. The deviation has been attributed to distance of the location from sea shore. Their calculations have revealed the importance of geothermal energy in creating atmospheric anomaly."It may mean the thermodynamically favorable conditions for these storms are migrating pole ward. This study is first of its kind in predicting in advance many earthquakes of magnitude above 5 Richter scale. This claim that was considered groundbreaking led by University of Miami (UM) scientist Shimon Wdowinski shows that earthquakes, including the 2010 temblors in Haiti and Taiwan, may be triggered by tropical cyclones (hurricanes and typhoons), according to a presentation of the findings at the 2011 AGU Fall Meeting in San Francisco. They have also stated that the tropical cyclone precipitation will be stronger when sea- surface temperatures are higher, but is not clear whether the stronger precipitation is associated with higher intensity rates or vice versa or both. This study showed that if the sea-surface temperatures are uniformly higher around the cyclone region, the cyclone sizes will be similar to the affected tropical zone. Such studies do indicate a possibility of triggering by weather they have concluded. However, this paper denies such logic that weather triggers earth shakes. Instead we assume the reverse that the precursors to the earthquake triggers weather as well as earthquakes.

Researchers analyzed 1,142 tropic cyclones worldwide by using high resolution space-borne radar and microwave measurements of precipitation aboard NASA's Tropical Rainfall Measuring Mission (TRMM) satellite and tropical cyclone track data from the International Best Track Archive for Climate Stewardship 22 program. They investigated the controlling factors of each of the tropical cyclone sizes and found that the relationship of the cyclone sizes with the intensity of the cyclones, combined with the absolute values of SSF together are weak, but the relationship between the relative values of the SST and the cyclone sizes is strong. However, "This research was conducted in the context of climate change, and their findings helped understand what controls the sizes of these storms and what measurement data are needed to better predict the impacted areas they cover, "They have tried to provide a relationship.

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Different web sites like provide different information on weather, and other very useful information about the location of rainfall; the storm history and satellite images gives cloud data and could be monitored over the epicentre area with ease. Whenever an anomaly is observed the extent of anomaly can be correlated with the energy expected for this anomaly. An empherical relationship do exists between weather anomaly and earthquake site up to a certain distance and this zone of influence may be estimated and complimented with other warning systems like Tsunami warning systems, Hurricane warning systems to enable the direction of mass movements and evacuations for disaster management teams.

Most earthquakes happen at the nearby places of rainfall event up to 20° variations in geological coordinates, usually in 1- 15 days to few weeks (2-4) and only in few cases it takes more than 4 weeks. Just on seeing a rainfall indication above 50 mm on a weather map we can expect future earthquakes of magnitude 4-6 may be on the horizon to the nearby places of rainfall. Earthquake of magnitude above 8 will come only to the nearby places of incredibly unexpected historic weather changes. The confident level of happenings of earthquakes to the nearby places after weather changes is 100% with the variation in expected precise location (depends on the location of origin of weather changes, eg. a cyclone can move thousands of kilometer away from its origin) and magnitude (severity of weather also depends site geological condition). An analysis performed for the Turkey region has been published earlier. This paper deals extensively on the rainfall, Snowfall and Snow storm anomaly, its occurrence and the earthquake event that is predicted in the epicentres and also deals with geological coordinates in detail. After careful analysis of the various data on the assumption that the earthquake precursors generate more energy that was used for creating a rainfall 49 mm is considered as Prakash limit.

The chaotic atmospheric effects may be negligible and assuming only the geothermal energy release from the known epicentres control the atmosphere the Principal author has observed that an anomaly above Prakash limit of rainfall will necessitate us to use this early warning system. When rainfall is 50 mm the anomaly will be 1mm. Then the strategy shown will indicate a warning of earthquake of 4 magnitudes near the nearest epicentre location. The disaster assessment team can be alerted to plan their own strategies in advance or use stand II alerts when ever such symptoms arise in the vicinity of nearest known s. If the centre lies in ocean then may

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be linked to Tsunami warning system. When the factor X< 50 we can expect a earthquake between 4-5 Richter scale. When anomaly in rain fall exceeds and or accompanied by extreme heat wave emission leading to forest fire then the magnitude is between 6 to 7 Richter. When anomaly exceeds 50, heavy snowfall and major change in the ocean tides leading to Tsunami are noticed the magnitude expected may be greater than 7 Richter scale. The time lag between weather anomaly notice and occurrence of earthquake and arrival at epicentre may be 10 to 15 days.

World of precursor area and the corresponding epicentre zones have been summarized and presented in the supplementary data. In these area both the rainfall and the earthquakes happen repeatedly and in recurrent pattern

9. ULTIMATE AIM

Our Collaborative studies direct us towards an optimistic goal of an integrated data analysis approach. Using AI tools and companion, a unified approach to predicting earthquake is not far away, climate anomaly is a great clue like the anxiety of animals, Radon presence, etc. With the GPS system, the location of the expected earthquake may be observed, the temperature, ground water level data may be integrated to yield the estimated magnitude and time of earthquake. A warning system based on such prediction may be subjected to error analyses and the predictability probability may be enhanced. An effort in this regard is quite need when compared to the loss of human lives and infrastructures.

Limitations

The climate anomaly do have a correlation with the earthquake occurrence more than 90%, however the earthquake magnitude greater than four up to 6,7 can be predicted. Very large earthquake magnitude greater than 8 is very less than 4 do not have any associated massive climate anomaly. The dynamics proposed based on the main anomaly may require more parameters for identifying the exact magnitude, location and distance from the area of occurrence. Advent of GPS based alerts need to be integrated with atmospheric anomalies which requires international sharing and collaboration.

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10. CONCLUSION

Nature is quite simple and yet more powerful. The challenge we encounter by nature phenomenon like earthquakes are mostly advancing our knowledge on nature. Hence more knowledge on earth and its environment will be enlightening humans by a unified integrated approach. The trio believe that earthquakes are predictable but not all are. If we can predict higher magnitude of earthquake we can offer an excellent warning system to manage the earthquake and to reduce the losses.

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